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AGGREGATE RESOURCE INVENTORY OF THE RURAL MUNICIPALITY OF BROKENHEAD

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TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	1
Objectives	1
Acknowledgements	1
Location, Access, Drainage	1
Previous Work	3
Present Study	3
Bedrock Geology	5
Quaternary History	7
Surficial Geology	7
SAND AND GRAVEL RESOURCES	14
Quality of Sand and Gravel	14
Reserves of Sand and Gravel	14
Demand for Sand and Gravel	18
Supply and Demand for Sand and Gravel	19
Silica-Rich Sand	19
NEAR-SURFACE BEDROCK	19
CONCLUSIONS	24
REFERENCES	25

LIST OF TABLES

Table 1. Sand and Gravel Resources in the R.M. of Brokenhead.	15
Table 2. Estimated Reserves of Sand and Gravel Within the R.M. of Brokenhead.	18
Table 3. Estimated Annual Demand for Sand and Gravel Within the R.M. of Brokenhead.	18
Table 4. Geochemical Analysis of Silica-Rich Sand.	22
Table 5. Maximum Value Engineering Test Requirements of Aggregate Derived from Crushed Bedrock.	23
Table 6. Bedrock Engineering Specifications.	24

LIST OF FIGURES

		Page
Figure 1.	Location of the Rural Municipality of Brokenhead	2
Figure 2.	Bedrock geology of the Rural Municipality of Brokenhead (after Bannatyne and Jones, 1979).	4
Figure 3.	Ordovician limestone bedrock exposed at Garson quarry, NW 3-13-6 E.P.M.	5
Figure 4.	Near-surface (less than 3 m) bedrock after Bannatyne and Jones, 1979).	6
Figure 5.	Glaciofluvial bedded outwash silica-rich sand at N½ of 9-15-7 E.P.M. Survey pole divided into 1 foot units.	8
Figure 6.	Airphoto (A25230-25, 1:15 840) illustrating lacustrine clay plain with iceberg scours.	9
Figure 7a.	Stratigraphic cross-section through the Rural Municipality of Brokenhead. Modified after Michalyna, Gardiner, Podolsky (1975) and Lebedin (1978).	10
Figure 7b.	Location of drill logs for stratigraphic cross-sections.	11
Figure 8.	Airphoto (A25229-15, 1:15 840) illustrating sand and gravel deposits (1) beach ridge, (2) glaciofluvial sand, and (3) silica-rich sand.	12
Figure 9.	Glaciofluvial deposit 3913 (NE 13-14-7 E.P.M.) mined to depletion and rehabilitated. The pit was mined below the water table and is currently stocked with fish.	13
Figure 10.	Silica-rich sand quarried from glaciofluvial deposit at Beausejour (NE 35-12-7 E.P.M.).	20
Figure 11.	Location of backhoe test pits containing silica-rich sand.	21

LIST OF APPENDICES

Appendix 1	Grain Size Distribution and Industrial Usage Assessment	28

LIST OF MAPS

Map OF82-5-1	Aggregate Resource Inventory of the Rural Municipality of Brokenhead.	(in pocket)

ABSTRACT

An aggregate resource inventory was conducted within the Rural Municipality of Brokenhead. Field investigations included mapping the surficial geology and subsurface testing of selected sand, gravel and silica-rich sand deposits. Surficial deposits are predominantly clays and calcareous till with secondary glaciofluvial and littoral sand and gravel deposits. Total reserves of sand and gravel are estimated at 11.8 million cubic metres with an annual demand of 105 000 cubic metres. Several silica-rich sand deposits were found to outcrop near the surface along the western portion of the municipality. The near-surface bedrock is suitable for use as base course, fill or surfacing gravel.

INTRODUCTION

Objectives

Field mapping within the Rural Municipality of Brokenhead was initiated with the following objectives:

1. To evaluate the distribution and quality of sand and gravel deposits as an aid for land use planning;
2. To evaluate silica-rich sand;
3. Map the surficial geology to obtain a more detailed understanding of the Quaternary stratigraphy; and
4. To determine the suitability of near-surface bedrock for crushed stone.

Acknowledgements

This report is primarily based on field investigations conducted by G. Conley, who mapped the surficial geology within the Rural Municipality of Brokenhead during 1980. Sand and gravel computer data analysis was conducted by staff of the Aggregate Resources Section. The author is grateful to B. Bannatyne and C. Jones who collected selected bedrock samples.

Location, Access, Drainage

The Rural Municipality of Brokenhead is located approximately 48 km northeast of Winnipeg (Fig. 1). The 1976 population of the municipaltiy was 2900 (Department of Municipal Affairs, 1980) and major settlements in the municipality include the Town of Beausejour, Village of Garson and the Community of Tyndall.

Access is by Provincial Trunk Highways 12 and 44, Provincial Roads 317, 316, 435, 215 and 302, and by gravelled section roads.

The municpality is characterized by a gently undulating clay plain at 243 m a.s.l. The highest elevation is Wolverine Hill, part of the Belair Interlobate Moraine, in the northwest at 266 m a.s.l.

The Brokenhead River, which flows northward through the eastern part of the municipaltiy towards Lake Winnipeg, is the most notable drainage feature. It collects surface

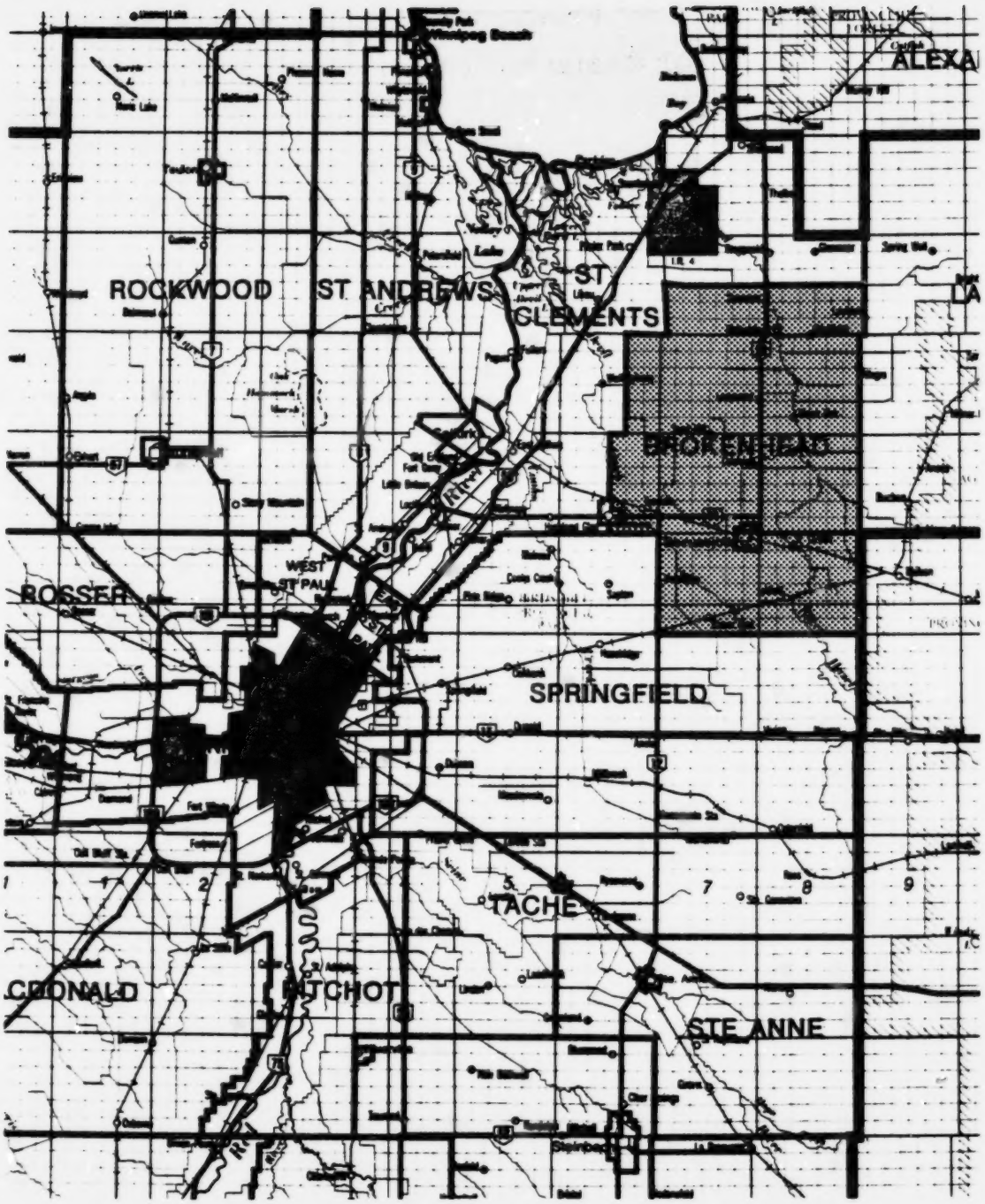


Figure 1. Location of the Rural Municipality of Brokenhead.

water from the eastern portion of the municipality, while the western portion is drained to the west and north-west by Devils Creek and several man-made drainage ditches.

Previous Work

Dowling (1900) described the bedrock outcrops along the east shore of Lake Winnipeg in one of the first geological reports to include the map area. Descriptions of limestone building stone production for the Garson-Tyndall area are presented by Parks (1916) and Goudge (1933, 1944). Macauley et al., (1951) described outcrops of the Winnipeg Formation. Baillie (1952) mapped and described the Ordovician Geology of Lake Winnipeg and adjacent areas. A summary of geology and industrial minerals within the municipality are presented by Davies et al., (1962).

The depositional history of the Winnipeg Formation is described by Vigrass (1971). The geology of the Garson area is described by Kent et al., (1972) and again by Bannatyne (1975). Drift thickness, geology and bedrock topography data are on several map series; notably by Klassen et al., (1970), Teller et al., (1976) and Little (1980).

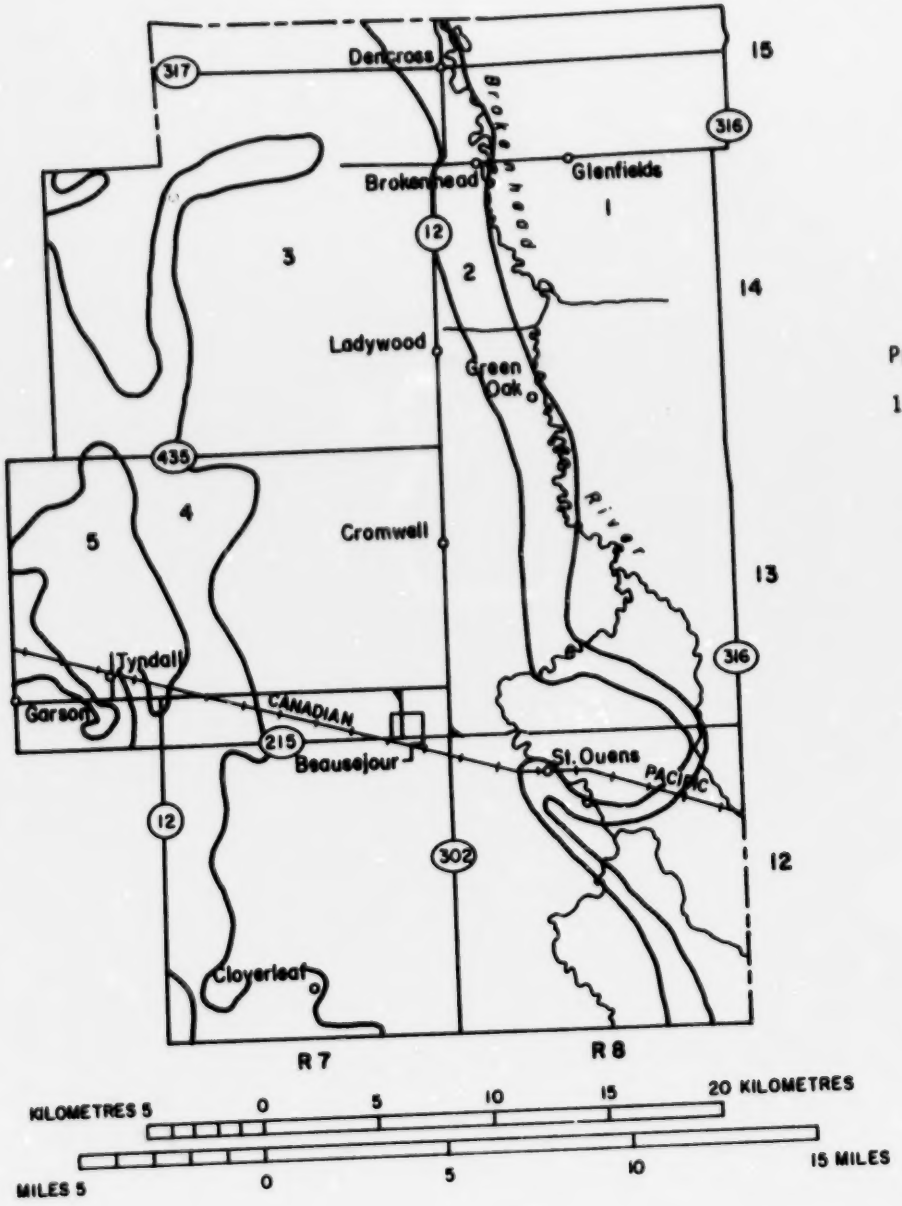
Early Quaternary studies in Manitoba recognized the former existence of Lake Agassiz and mapping of its associated beach ridges began (Keating 1825, Hind 1859 and Upham 1890). The boundaries of ice-sheets and final drainage of Lake Agassiz were presented by Antevs (1931). Lake Agassiz deposits and raised beaches were first mapped and described by Johnston (1921) for the Winnipegosis and upper Whitemouth River areas. The study area was first mapped and the Lake Agassiz beaches described in detail by Johnston (1934, 1946). Pleistocene gravel deposits in the Winnipeg area were mapped by Organ (1952) with special reference to the Birds Hill deposit, and Ringrose (1979) described the stratigraphy and process of deposition of the same deposit. Elson (1965) mapped the extent of glacial Lake Agassiz and distribution of end moraines in southern Manitoba.

The objectives of more recent Quaternary studies in southeastern Manitoba have been to identify lithostratigraphic units and to deduce a sequence of depositional events. McPherson (1970) studied the Pleistocene geology of the Beausejour area recording two ice advances across the map area, one from the northeast and a second advance from the northwest. Wyder (1971) recorded a minimum of four glacial advances and retreats in south central Manitoba. Teller and Fenton (1980) recorded two ice advances and two readvances across south-eastern Manitoba.

Present Study

Surficial deposits were mapped using air photographs at scales of 1:50 000 and 1:15 840. Field investigations included the examination of natural exposures and road cuts. A backhoe was used to evaluate selected deposits.

Sand and gravel deposits were sampled either from existing pit faces or by backhoe. Size fractions greater than 8 cm were normally not included with the sample. Each sample was



Red River Formation

5 Selkirk Member: dolomitic limestone

4 Cat Head Member: dolomite to dolomite limestone

3 Dog Head Member: dolomitic limestone

2 Winnipeg Formation: kaolinitic shale and quartzose limestone

Precambrian

1. granite

Figure 2. Bedrock geology of the Rural Municipality of Brokenhead (after Bannatyne and Jones, 1979).

was sieved and the grain size distribution between 101.6 to 0.074 mm recorded. Grain sizes less than 0.74 mm were recorded as combined silt and clay. Geochemical analysis was performed on selected sand samples to determine the silica content. Engineering tests were performed on selected bedrock samples to determine the suitability of the bedrock for crushed stone.

Bedrock Geology

The bedrock within the Rural Municipality of Brokenhead consists of rock of Precambrian and Ordovician age (Fig. 2). The Precambrian bedrock, mainly granites and granite gneisses of the Superior Province of the Canadian Shield, outcrop in the northeast portion of the municipality.

The Winnipeg Formation of Ordovician age is composed of interbedded shale and sandstone with the sandstone unit composed of poorly consolidated well-rounded and frosted quartzose sand (Davies et al., 1962). Several small outcrops of the Ordovician Red River Formation are located north of Tyndall. The Red River Formation consists of mottled dolomitic limestone of the Dog Head Member, dolomite to dolomitic limestone of the Cat Head Member, and dolomitic limestone of the Selkirk Member (Bannatyne and Jones, 1979). The Red River Formation outcrops near Garson where the bedrock is mined as Tyndall stone (Fig. 3) a mottled dolomitic limestone used as building stone.

Figure 3. Ordovician limestone bedrock exposed at Garson quarry, NW 3-13-6 E.P.M.

In the western portion of the municipality, the Red River Formation lies close to the surface. Bedrock within 3 m of the surface is shown in Figure 4.

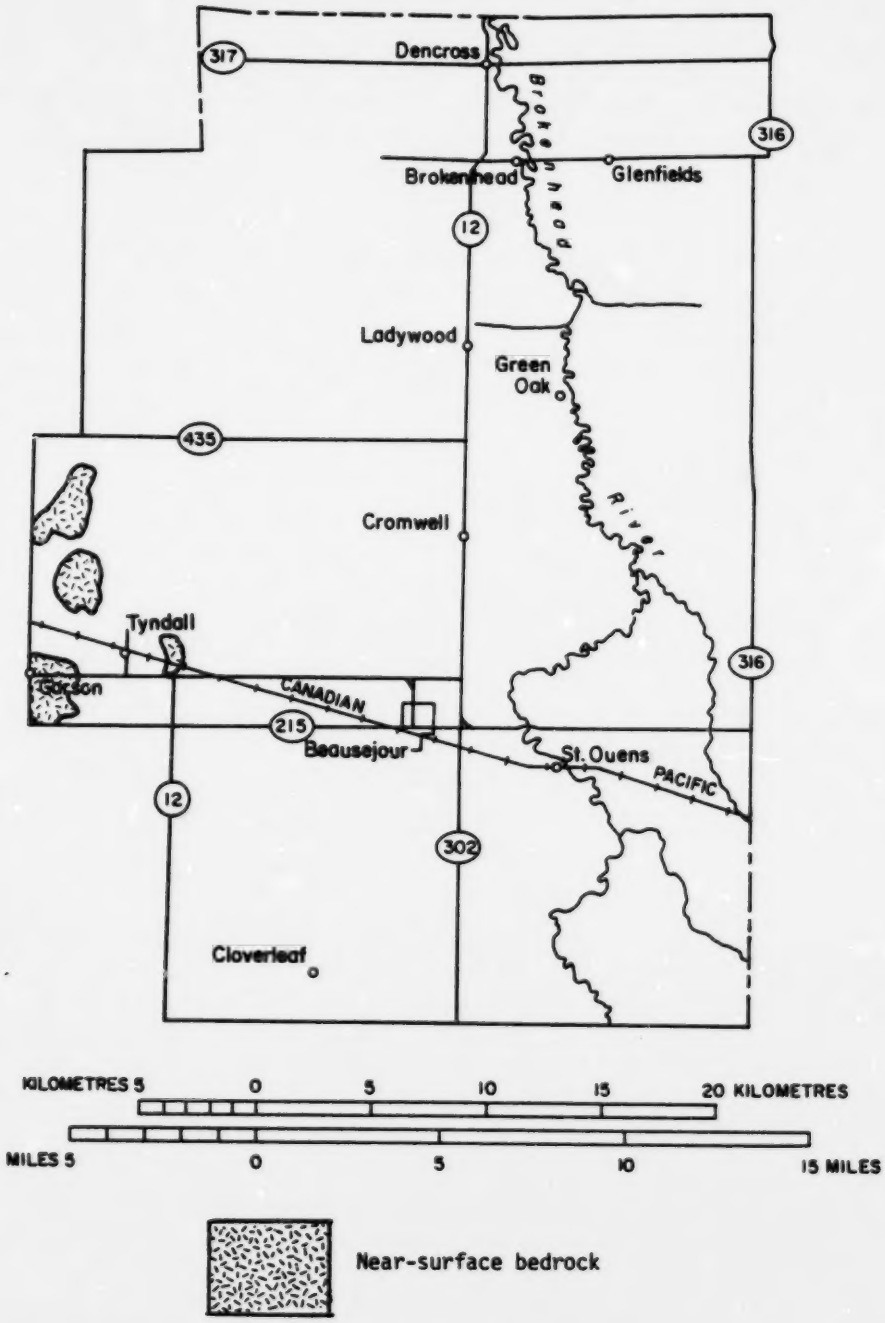


Figure 4. Near-surface (less than 3 m) bedrock (after Bannatyne and Jones, 1979).

Quaternary History

The earliest recognized ice advance within the municipality was from the northeast approximately 24 000 years B.P. (Teller and Fenton, 1980). The retreat of northeastern ice to the position of the Belair Moraine was contemporaneous with an ice advance from the northwest. The Belair Interlobate Moraine was formed during a major standstill of these two ice lobes (Nielsen and Matile, 1982). The northeast ice lobe retreated and stablized east of the municipality forming the Milner Ridge End Moraine. Continued expansion of northwestern ice advanced over both moraines and deposited the calcareous Libau Drift described by McPherson (1970). The retreat of northwestern ice was concurrent with the development of Lake Agassiz.

The entire municipality was covered by deep water lake sediment consisting of silt and clay. Fluctuations of the lake level were controlled by the opening and closing of eastern drainage outlets. A minor readvance of ice and subsequent retreat caused the level of Lake Agassiz again to rise. As the ice retreated from the area Lake Agassiz regressed forming a series of shoreline deposits around many of the higher land areas. By 11 000 years B.P., the last ice advance was gone from southern Manitoba (Teller and Fenton, 1980).

Surficial Geology

The surficial geology is shown on Map OF82-5 accompanying this report. Precambrian granite bedrock underlies the eastern portion of the municipality and minor outcrops are located in the northeastern portion of the municipality. Ordovician limestone bedrock outcrops near the surface at Garson and is exposed in the quarries at Garson.

The oldest known Quaternary unit within the municipality is thought to be a glaciofluvial silica-rich sand deposit located in a topographically high area approximately 6 km west of Dencross, specifically 9-15-7 E.P.M. The silica-rich sand forms the floor and lower 5 to 6 metres of an 8 metre deep pit (Fig. 5). This fine grained, well sorted, bedded sand has a paleocurrent direction ranging from 110^{o} to 180^{o}. Folds and faults in the bedded sands suggest deposition in a glaciofluvial ice-contact environment.

The dominant surficial sediment is Lake Agassiz silts and clays. These deposits are frequently laminated, consisting of dolomite, feldspar, quartz and clay minerals (McPherson, 1970). The terrain is moderately level with occasional iceberg scours (Fig. 6). The sediments are up to 20 m deep in the western portion of the municipality and 5 m in the eastern portion. Stratigraphically the silts and clays overlie till (Fig. 7a and 7b).

A beige, sandy calcareous till is present at or near the surface throughout the municipality. This till was deposited by the northwestern ice advance and is tentatively correlated with the Libau till (McPherson, 1970). A very hard, compact, grey, clayey till with few clasts has been observed underlying an olive-beige sandy till in several backhoe test pits. The lower till is correlated with the Belair till as described by McPherson (1970).

Figure 5. Glaciofluvial bedded outwash silica-rich sand at N½ of 9-15-7 E.P.M. Survey pole divided into 1 foot units.

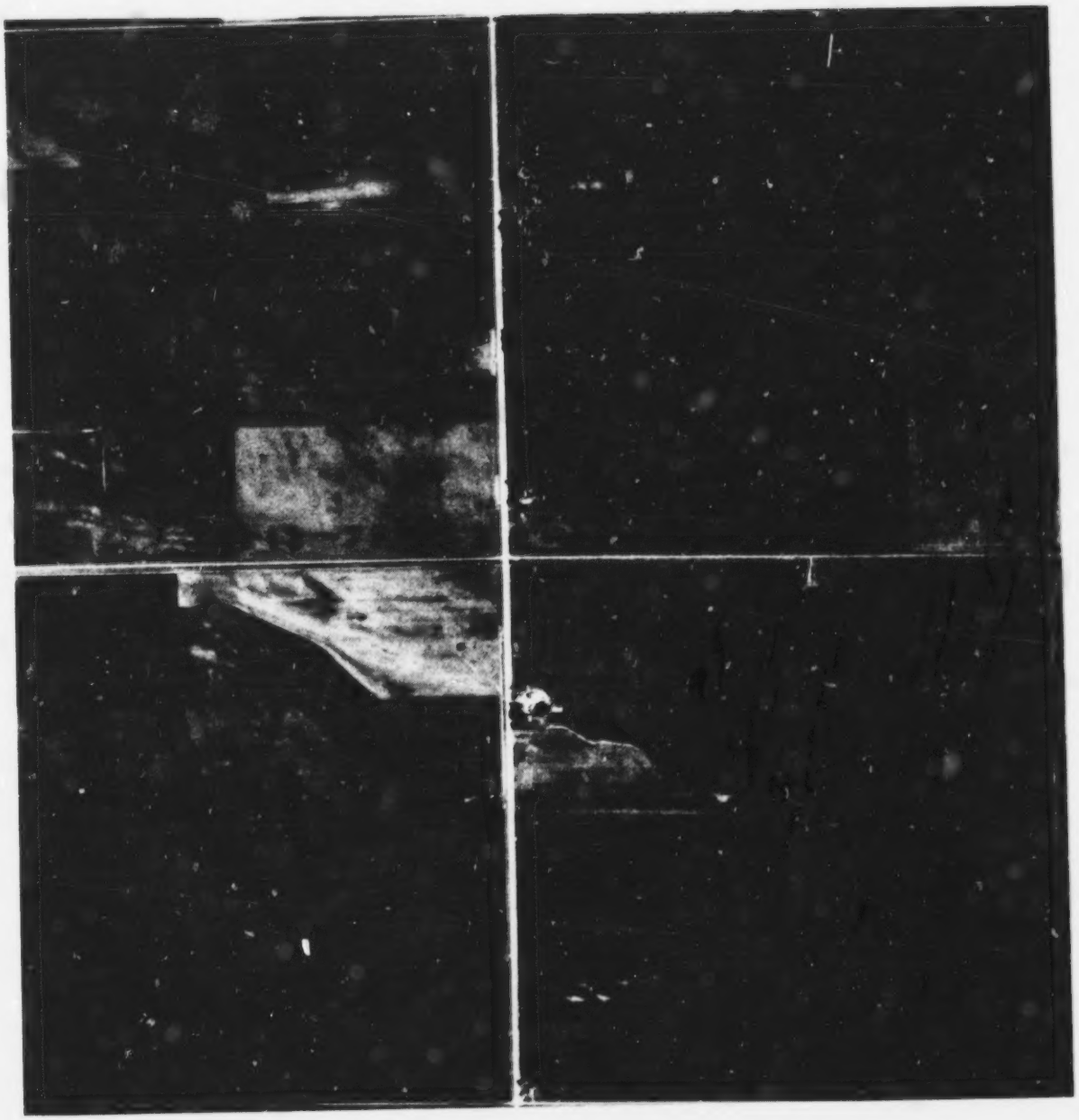


Figure 6. Airphoto (A25230-24, 1:15 840) illustrating lacustrine clay plain with iceberg scours.

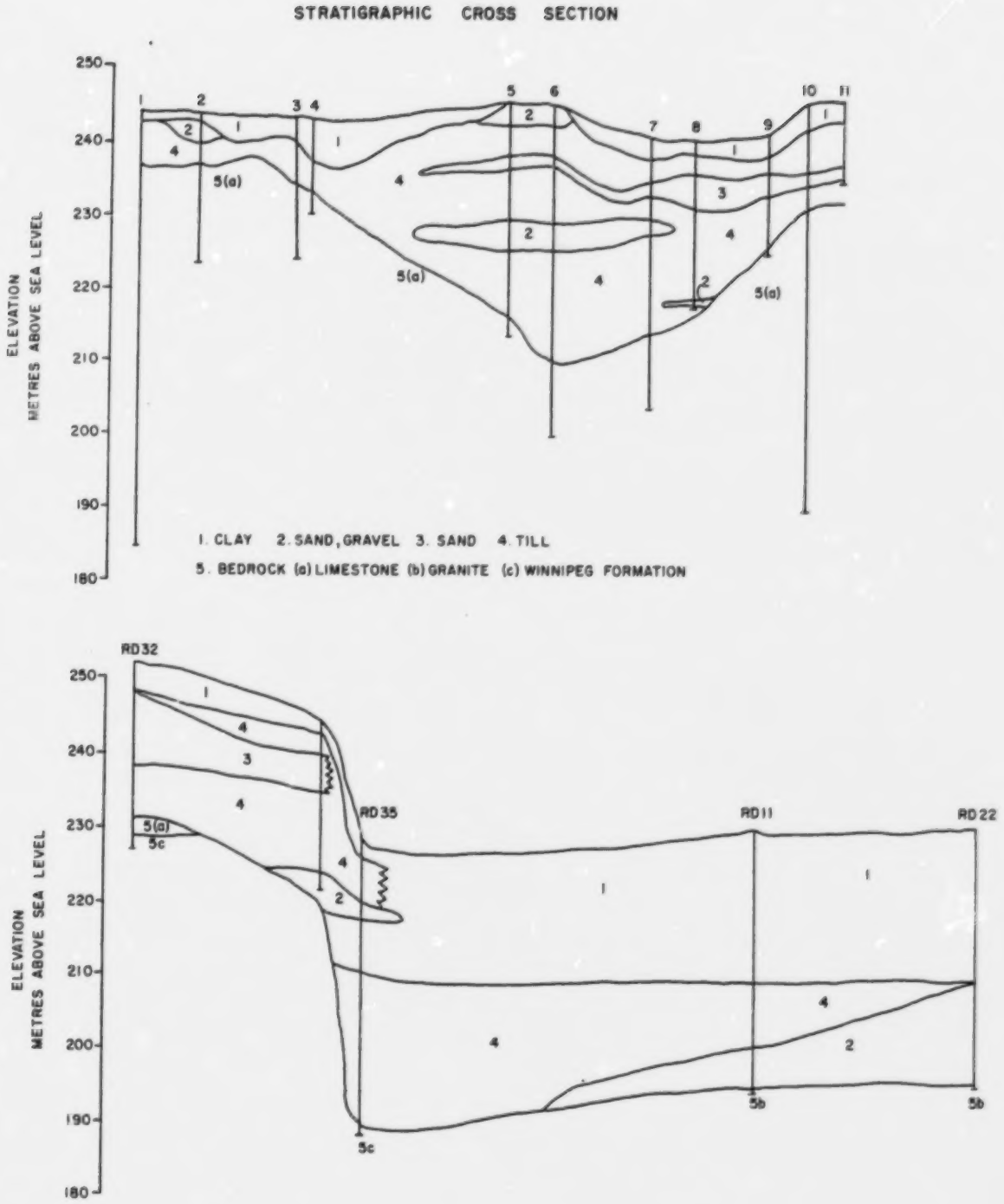


Figure 7a. Stratigraphic cross-section through the Rural Municipality of Brokenhead. Modified after Michalyna, Gardiner, Podolsky (1975) and Lebedin (1978).

Figure 7b. Location of drill logs for stratigraphic cross-sections.

Sand and gravel deposits consist of glaciofluvial silica-rich sand, glaciofluvial carbonate-rich sand and gravel almost exclusively in the form of eskers, and glaciolacustrine beach ridges (Fig. 8).

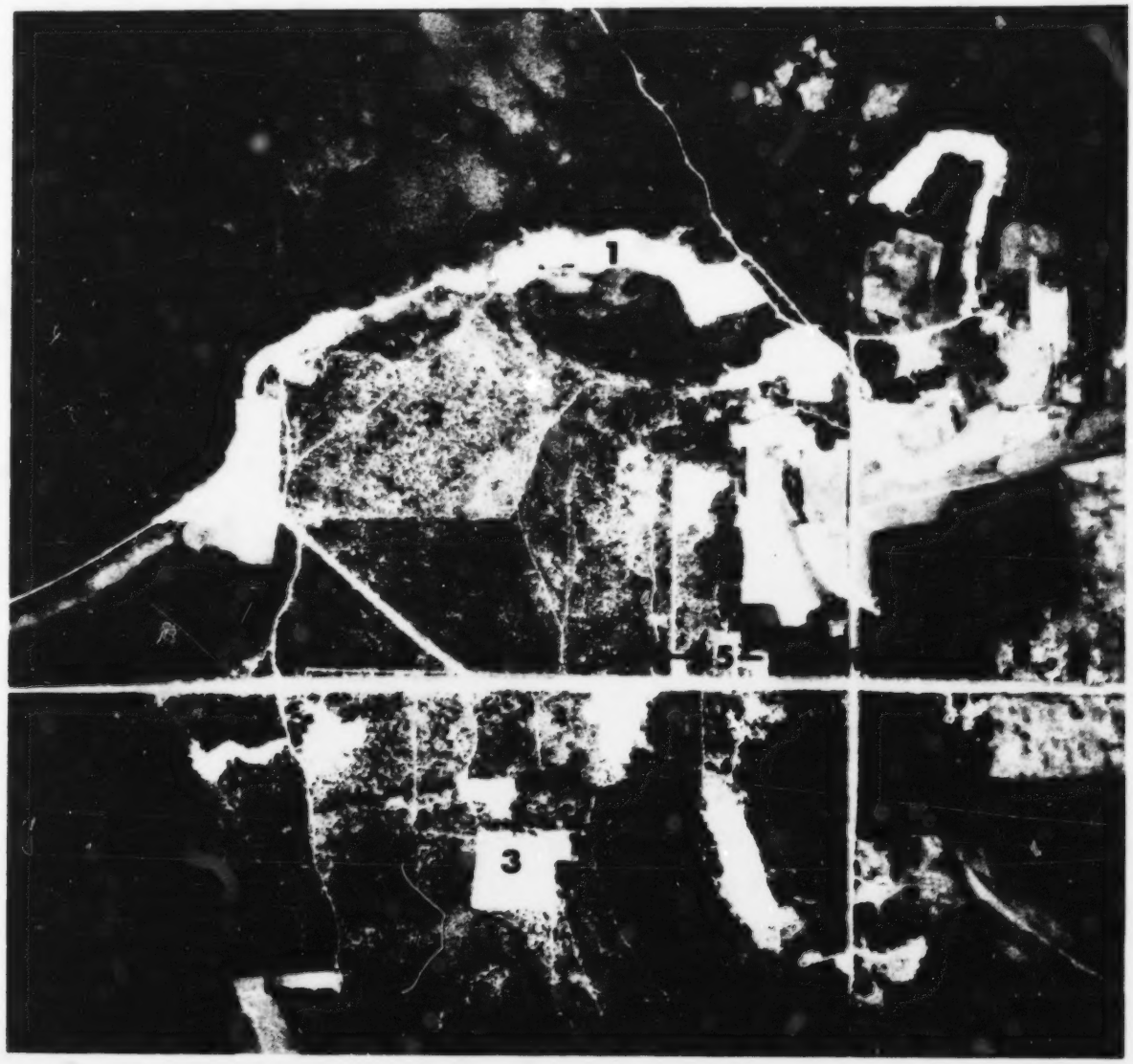


Figure 8. Airphoto (A25229-15, 1:15 840) illustrating sand and gravel deposits (1) beach ridge, (2) glaciofluvial sand, and (3) silica-rich sand.

Six eskers are associated with the upper till unit and all exhibit a west to east orientation and an easterly paleocurrent direction. The eskers are highly variable in composition, often ranging from a medium coarse sand and gravel to fine sand, and occasionally, laminated silts, over a distance of less than a kilometre. The eskers are usually overlain by till varying in thickness from a few centimetres to several metres, although a cover of

glaciolacustrine clays was observed at several locations (deposits 3923 and 3919). Only three eskers contained economic gravel, deposits 3923 and 3913 (Fig. 9) which are presently mined and near depletion, and deposit 3934 which is now depleted. The remaining eskers consist of sand, pebbly sand (deposit 3918) and clay and sand overlying gravel at a depth of 4 m (deposit 3919).

Figure 9. Glaciofluvial deposit 3913 (NE 13-14-7 E.P.M.) mined to depletion and rehabilitated. The pit was mined below the water table and is currently stocked with fish.

Other aggregate deposits associated with the upper till sheet are the numerous beaches marking still-stands of receding Lake Agassiz. Most beaches consist of sand or pebbly sand with the exception of the most northerly beaches at elevations of approximately 236 m (deposits 3900 and 3903). However, these beach deposits are near depletion. In the south, a large 4 m thick beach (deposit 3932) consisting of medium quality sandy fine pebble gravel lies adjacent to the hamlet of Cloverleaf. Generally, most beaches tend to be less than 2 m thick and less than 100 m wide. Glaciofluvial deposit 3926 near Bunker Hill (NW 24-12-8E) consists of sand and gravel containing several beds of well sorted granules in clast support. Cross-bedding indicates a paleocurrent direction of 155^{0}. Numerous large boulders are also present.

Recent deposits include seasonally submerged organic deposits in low-lying areas, and alluvial deposits along the Brokenhead River. The alluvium consists of silt and clay with minor organic deposits.

SAND AND GRAVEL RESOURCES

Quality of Sand and Gravel

A total of 34 sand and gravel deposits have been identified within the municipality. The generalized quality of each deposit is estimated based on field observations, the percentage gravel (sizes greater than 2.0 mm), estimated reserves, and potential industrial uses. Laboratory analysis was performed on 25 samples and included sieving the sample between 0.074 and 101.6 mm sizes. Sizes less than 0.074 mm were recorded as the combined silt-clay fraction. Sizes greater than 150 mm were not sampled but recorded in the field as crushable material.

The type of industrial uses for which the sample is suited is related to the grain size distribution. Although processing methods can modify the sediment to accommodate a variety of potential uses, the industrial uses are based on the natural (unprocessed) characteristics of the deposit. A computer program developed by the Aggregate Resources Section of the Mineral Resources Division correlates specification requirements (grain size distribution) of 48 different industrial uses with the grain size distribution data derived from laboratory testing of each sample. The computed results include individual ratings (suitable, marginal, or not suitable) for each correlation, and a positive or negative indication of whether screening is required; whether it is necessary to remove silt or clay from the deposit; whether crushable material is available on site; or whether it is necessary to add fines to meet the specifications for a particular use.

Size fractions greater than 8 cm were normally not included within the deposit sample. Size fractions greater than 15 cm are recorded in the field and referred to as crushable material. Due to the complexity of sampling the coarse size fractions (cobbles and boulders) this size fraction was not included with the grain size distribution and is reflected in the absence of suitabilities for the coarse aggregate specifications.

The grain size distributions and industrial use assessment for each sample are presented in Appendix I.

Reserves of Sand and Gravel

Each identified sand and gravel deposit is plotted on the map accompanying this report. The depth of each deposit was estimated based on topographic relief, generalized stratigraphy, site inspections and backhoe testing. The area distribution of each deposit was determined by planimetering using 1:50 000 scale maps. Reserve estimates were calculated by multiplying the deposit areal distribution by the average deposit depth.

The material content, generalized quality and estimated reserves of sand and gravel are shown in Table 1. Total reserves within the municipality are estimated at 11.8 million cubic metres. Reserves by quality are summarized in Table 2.

TABLE 1

Sand and Gravel Resources in the R.M. of Brokenhead

Deposit #	Generalized Material Content	Generalized Quality	Reserves (cu. m)	Land Use	Ownership	Comments
3900	Pebbly granules	High	404 000	Extraction	Crown Management; Some private; Municipality	Economic gravel only at fringes
3901	Gravel	Medium	46 800	Agricultural	Private	Possible extension of Deposit 3900
3902	Gravel	Medium	251 300	Agricultural	Private; Management	Possible extension of Deposit 3900
3903	Pebbly sand	Low	289 200	Temporary use	Crown	
3904	Pebbly sand	Low	906 400	Wildlife Management	Crown; Management	Up to 1.5 m coarse material over silica-rich sand at north end of deposit
3905	Pebble gravel	High	54 500	Temporary use	Crown	
3906	Pebbly sand	Medium	199 000	Forest	Private	
3907	Sandy fine pebble gravel	Medium	186 400	Agricultural	Private	
3908	Coarse pebble gravel	Medium-High	46 100	Easement	Private	
3909	Sandy cobbly pebble gravel	Medium	95 100	Forest	Private	
3910	Gravel	Medium	237 000	Extraction	Private; Municipal	Municipal pit
3911	Gravel	Medium	49 500	Forest	Private	
3912	Gravel	Medium	121 500	Forest	Private	Possible extension of Deposit 3910

TABLE 1 (continued)

Deposit #	Generalized Material Content	Generalized Quality	Reserves (cu. m)	Land Use	Ownership	Comments
3913	Coarse pebble gravel	High	326 800	Extraction	Private	
3914	Coarse pebble gravel	Medium	257 300	Temporary	Private	
3915	Sand	Low	268 500	Agricultural	Private	
3916	Sandy fine pebble gravel	Medium	588 400	Pasture	Private	
3917	Coarse Pebble gravel	Medium	93 000	Highway	Private	
3918	Pebbly sand	Low	56 000	Agriculture	Private	
3919	Sandy Pebble gravel	Medium	241 500	Agriculture	Private	Up to 4 m clay and sand over gravel
3920	Sandy coarse pebble gravel	Medium-Low	68 400	Highway	Private	
3921	Sandy fine pebble gravel	Medium-Low	405 900	Temporary	Private	70% depleted-possible silica-rich sands at depth
3922	Sand	Low	170 000	Agricultural	Private	No sample taken
3923	Sandy pebble gravel	Medium	313 200	Extraction	Private	70% depleted
3924	Sandy fine pebble gravel	Medium-Low	66 000	Temporary	Private	90% depleted (in Beausejour)
3925	Sand with occasional pebbles	Low	1 898 000	Agriculture	Private	
3926	Cobbly coarse pebble sand	Medium	643 200	Temporary	Private	Municipal dump nearby
3927	Sandy pebble gravel	Medium	10 000	Temporary	Private	90% depleted

TABLE 1 (continued)

Deposit #	Generalized Material Content	Generalized Quality	Reserves (cu. m)	Land Use	Ownership	Comments
3928	Coarse pebbly sand	Medium	412 000	Highway	Private	
3929	Pebbly sand	Low	152 000	Dump, unauthorized	Private; Municipal	
3930	Sand	Low	625 000	Agricultural	Private	
3931	Bouldery sand	Low	891 300	Agricultural	Private	Boulders available for crushing
3932	Sandy fine pebble gravel	Medium	1 119 000	Rail easement	Private	
3933	Sand	Low	312 000	Agricultural	Private	No sample taken
3834	Cobbly Coarse pebble gravel	Medium-High	8 500	Concrete plant	Private	Depleted above water table
		Total Reserves	11 812 800			

TABLE 2

Estimated Reserves of Sand and Gravel
within the R.M. of Brokenhead

Quality	Reserves (Cubic Metres)
Low	5 568 400
Medium-Low	540 300
Medium	4 864 200
Medium-High	54 600
High	785 300
TOTAL	11 812 800

Demand for Sand and Gravel

Estimation of the demand for sand and gravel was derived from consideration of:

i) Requirements of the Rural Municipality of Brokenhead;
ii) Requirements for the Town of Beausejour;
iii) Department of Highways upgrading and improvements; and
iv) Requirements of local construction companies.

The R.M. of Brokenhead utilizes a total of 30 000 cubic metres of sand and gravel annually. Of this, 18 000 cubic metres is mined outside the municipality, primarily from Seddons Corner, while an estimated 12 000 cubic metres is mined within the municipality. The Town of Beausejour purchases an estimated 10 000 cubic metres annually from private construction companies, of which an estimated 2 000 cubic metres is mined within the municipality.

The Department of Highways and Transportation is responsible for the maintenance of approximately 60 miles of provincial roads within the municipality. It is estimated that the Department of Highways and Transportation will utilize an estimated 78 000 cubic metres mined within the municipality. Private construction companies consume an estimated 13 000 cubic metres annually.

The estimated demand for sand and gravel within the municipality is shown in Table 3.

TABLE 3

Estimated Annual Demand for Sand and Gravel
within the R.M. of Brokenhead

User	Demand (Cubic Metres)
R.M. of Brokenhead	12 000
Town of Beausejour	2 000
Department of Highways	78 000
Construction Companies	13 000
TOTAL	105 000

Supply and Demand for Sand and Gravel

A comparison of supply and demand of sand and gravel shows there are an estimated 11.8 million cubic metres of naturally occurring sand and gravel of various qualities, with an annual demand of 105 000 cubic metres. Although the demand is sufficient to meet the requirements of the municipality for several years, the extraction of sand and gravel will be dependent upon the economics of mining the low quality reserves. Of the estimated 11.8 million cubic metres of reserves only 785 300 cubic metres are high quality and at current rates of extraction, the high quality reserves would be consumed within seven years.

Silica-Rich Sand

Two silica-rich sand deposits are currently being mined within the municipality. One operation is within the town limits of Beausejour (Fig. 10) and the second is the Mars Hill area (Deposit 3904). The primary uses of the silica-rich sands are in the production of portland cement and, in the past, for sand-lime brick and glass. The Beausejour deposit contains 76-89 per cent SiO_2.

Several silica-rich sand deposits were observed in backhoe test pits (Fig. 11). Silica-rich sand underlies littoral sand at sample location 8, and underlies the till at sample locations 1 and 5. The geochemical analysis of the silica-rich sand sampled from backhoe test pits are shown in Table 4. The lateral and horizontal distribution of these secondary sites have not been confirmed as more detailed research is required to accurately delineate the geological boundaries.

NEAR-SURFACE BEDROCK

Near-surface limestone bedrock was evaluated for potential uses as crushed stone, an alternate source of sand and gravel. Two bedrock samples from the Selkirk Member of the Ordovician Red River Formation were tested. The samples were obtained from the mottled dolomitic limestone beds from Gillis quarries in Garson.

Tests selected were based in specifications from the American Society for Testing and Materials (A.S.T.M.), the Canadian Standards Association (C.S.A.), and from data supplied by Provincial contractors and engineering firms. Specific tests included;

(1) Los Angeles abrasion which is a measure of the abrasive resistance of the bedrock.

(2) Sodium sulphate soundness which is designed to measure a sample's resistance to disintegration.

(3) Absorption which is a measure of the increase in weight of a porous solid body resulting from penetration of a liquid into the rock's permeable pores.

The Aggregate Resources Section has developed Table 5 which summarizes some of the engineering specifications for various end uses of crushed stone. Included within the table

Figure 10. Silica-rich sand quarried from glaciofluvial deposit at Beausejour (NE 35-12-7 E.P.M.).

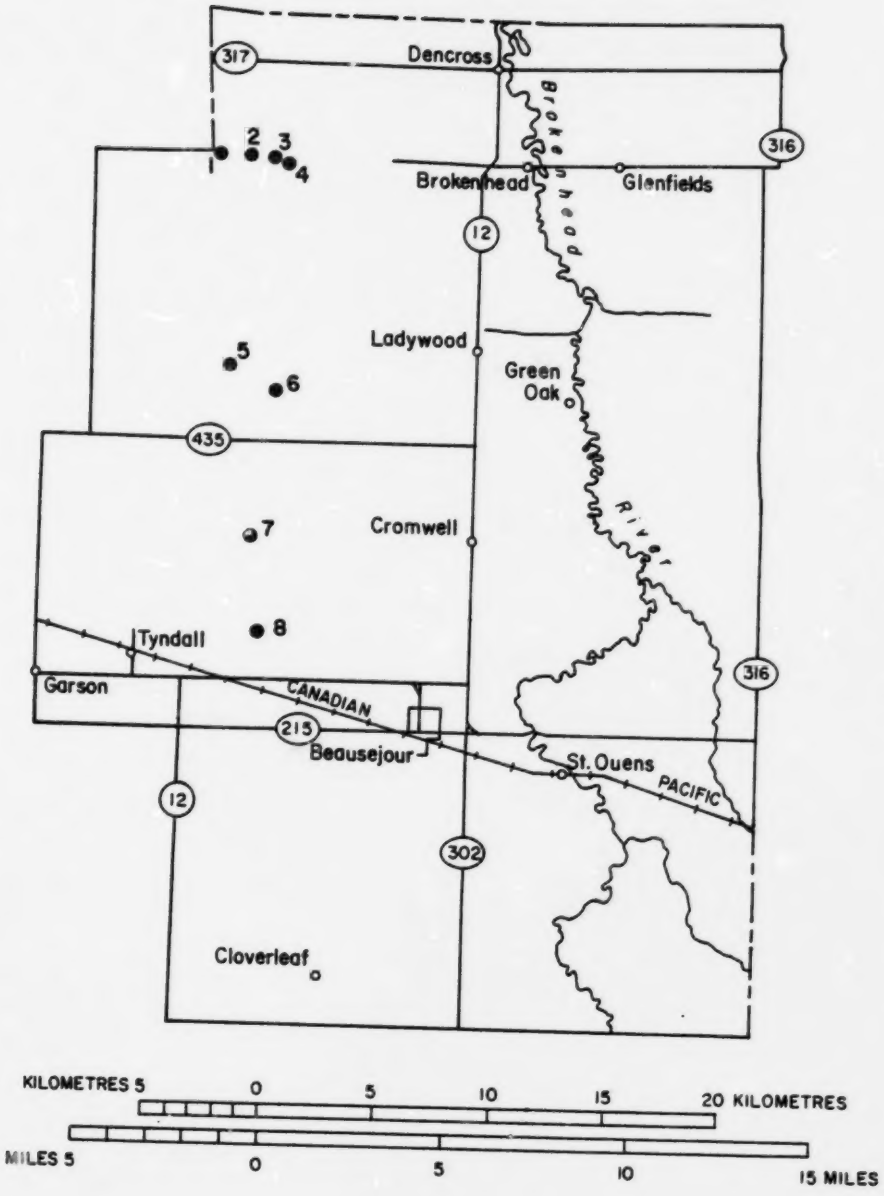


Figure 11. Location of backhoe test pits containing silica-rich sand.

TABLE 4

Geochemical Analysis of Silica-Rich Sand
(oxide weight per cent)

Sample	1	2	3	4	5	6	7	8
SiO_2	87.10	90.25	87.45	82.75	90.25	84.75	86.70	88.20
Al_2O_3	4.94	5.07	4.67	6.38	3.23	3.75	3.38	3.97
Fe_2O_3	0.45	0.20	0.43	0.71	0.40	0.23	0.23	0.49
FeO	0.27	0.15	0.23	0.37	0.16	0.18	0.14	0.26
CaO	2.30	0.78	2.38	3.33	2.17	4.18	3.99	2.40
MgO	0.27	0.10	0.27	0.57	0.21	0.67	0.57	0.33
Na_2O	1.40	1.44	1.28	1.75	0.76	0.95	0.90	0.97
K_2O	0.91	1.00	0.83	1.22	0.71	0.74	0.65	0.87
TiO_2	0.07	0.04	0.07	0.11	0.06	0.04	0.04	0.10
P_2O_5	0.04	0.04	0.04	0.07	0.05	0.04	0.03	0.06
MnO	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
NiO								
Cr_2O_3								
H_2O	0.30	0.28	0.27	0.41	0.40	0.27	0.24	0.37
S								
CO_2	1.24	0.12	1.38	2.12	1.41	3.55	2.95	1.51
TOTAL	99.30	99.48	99.31	99.80	99.82	99.36	99.83	99.54

TABLE 5

Maximum Value Engineering Test Requirements
of Aggregate Derived from Crushed Bedrock

TEST	BASE COURSE CLASS A	BASE COURSE CLASS B	TRAFFIC TYPE A	BITUMINOUS CLASS A	CONCRETE FINE	CONCRETE COARSE	BALLAST	TERRAZO AGGREGATE
Los Angeles Abrasion % Loss	60		35	35		50 40 35(1)	40	25
Sodium Sulphate Soundness % Loss				12	16	12	10	6
Absorption - %				1-2	1-2		0.5-1.0	
Shale - %	15	5	15					
Fineness Modules					2.3 to 3.1			

(1) The abrasion loss shall not be greater than 35 per cent when aggregate is used in concrete paving or for other concrete surface subjected to significant wear.

is the percentage shale which is the allowable percentage deleterious material, and the fineness modules which is an empirical factor of coarsness or fineness of aggregate relating the amount of water and cement that must be used in producing a workable mixture of concrete.

Sample 16 was obtained from Beds A-D and sample 17 from Beds E-I of the Selkirk Member (Wallace and Greer, 1927). Results of the engineering tests are shown on Table 6. A comparison of Table 5 and 6 shows the bedrock to be suitable for Type B base course, fill or surfacing gravel. Due to high soundness loss and absorption both samples would be marginal for use in concrete. The samples would not be considered for use as ballast.

TABLE 6

Bedrock Engineering Specifications

Test	Sample	
	16	17
Los Angeles Abrasion	51.1%	48.4%
Bulk Specific Gravity	2.38	2.42
Bulk Specific Gravity (Saturated Surface Dry Basis)	2.49	2.51
Apparent Specific Gravity	2.64	2.65
Absorption	4.0%	3.5%
Porosity	9.6%	8.5%
Soundness Loss		
1 1/2" to 3/4"	8.0%	3.5%
3/4" to 1/2"	10.4%	12.2%
1/2" to 3/8"	18.6%	21.3%

CONCLUSIONS

There are 34 identified sand and gravel deposits within the Rural Municipality of Brokenhead. Total reserves are estimated at 11.8 million cubic metres of which 785 300 cubic metres are high quality. There are sufficient reserves of medium and high quality sand and gravel to supply the requirements within the municipality in excess of 25 years. Near-surface bedrock may be considered as an alternate source of sand and gravel for base course, fill or surfacing gravel. Near-surface silica-rich sands have been observed to trend north from Beausejour to Mars Hill. Further investigation would be required to delineate the extent of these deposits.

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APPENDIX I

GRAIN SIZE DISTRIBUTION AND INDUSTRIAL USAGE ASSESSMENT

SAMPLE IDENTIFICATION 003900A01507E16NWEN621
AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES
WEIGHT OF SAND 3962.60 GMS. WASHED SAMPLE - WEIGHT BEFORE 838.10 AFTER 828.50 % LOSS 1.15

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		390.30	7.57	92.43	7.57
2 IN		0.0	0.0	92.43	7.57
1 1/2 IN		178.10	3.45	88.98	11.02
1 IN		270.10	5.24	83.74	16.26
3/4 IN		554.80	10.76	72.98	27.02
5/8 IN	50.70	239.91	4.65	68.33	31.67
1/2 IN	62.60	314.89	6.11	62.22	37.78
3/8 IN	73.80	348.93	6.77	55.45	44.55
1/4 IN	69.20	342.15	6.64	48.81	51.19
# 4	69.40	295.45	5.73	43.08	56.92
# 8	41.10	255.68	4.96	38.12	61.88
# 8	121.00	855.10	16.59	21.53	78.47
# 10	32.60	574.10	11.14	10.39	89.61
# 16	22.50	154.14	2.99	7.40	92.60
# 30	16.50	106.58	2.06	5.34	94.66
# 40	11.20	69.40	1.35	3.99	96.01
# 50	21.50	142.08	2.76	1.23	98.77
# 80	9.70	54.13	1.05	0.18	99.82
# 100	1.90	4.52	0.09	0.09	99.91
# 200	0.10	2.90	0.06	0.03	99.97
<200 + M	9.60	1.39	0.03	0.0	100.00
TOTALS	838.10	5155.59			

SPLITTING FACTOR 4.73
FINENESS MODULUS 5.22
% COBBLES 7.57 % PEBBLES 43.67 % GRANULES 14.09 % SAND 33.79 % SILT/CLAY 0.88

INDUSTRIAL USAGE ASSESSMENT

003900A01507E16NWEN621

****
* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	1.90	MARGINAL	YES	YES			
ASPHALT B (P. OF M.)	0.85	MARGINAL	YES	YES			
ASPHALT C (P. OF M.)	46.82	NOT SUIT	YES	YES			
BASE COURSE A (P. OF M.)	0.85	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	1.01	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	1.01	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	1.05	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE B (ASTM D1241)	4.02	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	1.95	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	11.34	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	4.95	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	41.70	NOT SUIT	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	10.41	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL B (P. OF M.)	0.85	MARGINAL	YES	YES			
TRAFFIC GRAVEL C (P. OF M.)	0.51	MARGINAL	YES				
SEAL COAT A (P. OF M.)	0	SUITABLE	YES				
SEAL COAT B (P. OF M.)	80.62	NOT SUIT					
SEAL COAT C (P. OF M.)	14.87	MARGINAL	YES		YES		YES
COARSE AGGREGATE 1 (ASTM C33-D448)	1.11	MARGINAL	YES				YES
COARSE AGGREGATE 2 (ASTM C33-D448)	178.26	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33-D448)	166.26	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33-D448)	156.94	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33-D448)	144.38	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33-D448)	109.38	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33-D448)	162.95	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33-D448)	95.10	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33-D448)	157.36	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33-D448)	125.17	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33-D448)	97.31	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33-D448)	133.08	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33-D448)	104.12	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33-D448)	108.06	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33-D448)	103.78	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33-D448)	121.21	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33-D448)	135.41	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33-D448)	96.37	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	64.25	NOT SUIT					
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	10.88	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	29.92	MARGINAL	YES				
MORTAR (ASTM C144)	27.34	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	17.76	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	9.34	MARGINAL	YES				
AIRFIELD RUNWAYS (P. OF M.)	104.28	NOT SUIT					
PIT RUN (P. OF M.)	0.28	MARGINAL	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES				
SHOULDERS (P. OF M.)	16.58	MARGINAL	YES		YES		
	0.0	SUITABLE	YES				

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003903A01507E11SEEN558A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3398.40 GMS. WASHED SAMPLE - WEIGHT BEFORE 818.30 AFTER 808.40 % LOSS 1.21

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		334.00	7.70	92.30	7.70
1 1/2 IN		113.30	2.61	89.69	10.31
1 IN		454.50	9.61	80.07	17.33
3/4 IN		167.70	4.55	75.52	21.88
1/2 IN	0.00	33.20	0.77	74.75	22.65
3/8 IN	0.00	36.80	0.69	74.06	23.31
1/4 IN	24.30	100.92	2.33	71.74	25.64
#4	29.40	122.10	2.81	68.92	28.46
#6	17.00	70.60	1.63	67.29	30.08
#8	19.60	152.00	3.50	63.79	33.58
#10	15.40	81.50	1.89	61.91	35.46
#16	15.60	84.70	1.49	60.42	36.95
#30	89.20	233.40	6.38	54.04	43.33
#40	114.00	473.44	10.93	43.11	54.26
#50	209.30	786.16	18.13	24.98	73.39
#80	235.20	972.03	22.43	2.55	95.83
#100	55.10	110.00	2.54	0.01	98.37
#200	25.10	16.70	0.39	0.0	98.76
<200 + W	9.90	41.11	0.95	0.0	100.00
TOTALS	818.30	4337.89			

SPLITTING FACTOR 4.15

FINENESS MODULUS 3.66

% COBBLES 0.0 % PEBBLES 30.08 % GRANULES 4.69 % SAND 64.28 % SILT/CLAY 0.95

INDUSTRIAL USAGE ASSESSMENT

003903A01507E11SEEN558A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	83.78	NOT SUIT					
ASPHALT B (P. OF M.)	73.85	NOT SUIT					
ASPHALT C (P. OF M.)	15.15	MARGINAL	YES	YES			
BASE COURSE A (P. OF M.)	84.85	NOT SUIT					
BASE COURSE B (P. OF M.)	31.35	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	95.35	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	72.35	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	84.66	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	28.14	MARGINAL	YES	YES			YES
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	12.24	MARGINAL	YES	YES			YES
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	6.85	MARGINAL	YES	YES			YES
TRAFFIC GRAVEL A (P. OF M.)	113.23	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	83.62	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	63.62	NOT SUIT					
TRAFFIC GRAVEL D (P. OF M.)	41.92	NOT SUIT					
SEAL COAT A (P. OF M.)	121.74	NOT SUIT					
SEAL COAT B (P. OF M.)	98.03	NOT SUIT					
SEAL COAT C (P. OF M.)	72.06	NOT SUIT					
COARSE AGGREGATE 1 (ASTM C33; D448)	188.03	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33; D448)	170.72	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33; D448)	169.04	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33; D448)	159.67	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33; D448)	160.03	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33; D448)	150.32	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33; D448)	142.32	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33; D448)	145.65	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33; D448)	103.65	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33; D448)	103.19	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33; D448)	102.79	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33; D448)	146.01	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33; D448)	132.01	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33; D448)	179.15	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33; D448)	135.50	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33; D448)	110.42	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33; D448)	109.35	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33; D448)	159.22	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33; D448)	15.58	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	18.58	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	20.58	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	20.20	MARGINAL	YES				YES
MORTAR (ASTM C144)	0.01	MARGINAL	YES				
PORTLAND CEMENT (P. OF A.)	68.60	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	179.65	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	64.81	NOT SUIT					
PIT RUN (P. OF M.)	0.0	NOT SUIT					
SEPTIC FIELDS (U.M.A.)	15.35	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	5.75	MARGINAL	YES		YES		

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 6

SAMPLE IDENTIFICATION 003905 01407E31NEEN620A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 4370.70 GMS. WASHED SAMPLE - WEIGHT BEFORE 741.10 AFTER 724.20 % LOSS 2.28

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		0.0	0.0	100.00	0.0
3/4 IN		133.50	2.79	97.21	2.79
5/8 IN	29.30	162.80	3.94	93.27	6.73
1/2 IN	56.70	419.72	5.50	87.77	12.23
3/8 IN	87.10	544.18	7.35	80.54	19.46
1/4 IN	144.50	513.66	10.73	70.81	29.19
#4	103.90	855.20	17.80	53.02	46.98
#8	193.90	842.28	23.41	29.61	70.39
#10	33.90	1114.05	2.26	27.34	72.66
#16	27.90	1199.93	2.17	25.17	74.83
#30	38.70	104.54	3.44	21.73	78.27
#40	7.00	226.24	4.77	16.97	83.03
#50	1.80	17.69	0.37	16.60	83.40
#80	1.80	10.62	0.22	16.37	83.63
#100	1.50	20.94	0.43	15.94	84.06
#200	5.30	36.85	0.18	15.76	84.24
<200 + W	16.90	39.67	0.68	15.08	84.92
TOTALS	741.10	4788.78	2.08	0.0	100.00

SPLITTING FACTOR 5.90

FINENESS MODULUS 5.63

% COBBLES 0.0 % PEBBLES 60.39 % GRANULES 27.44 % SAND 10.09 % SILT/CLAY 2.08

I

INDUSTRIAL USAGE ASSESSMENT

003905 01407E31NEEN620A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
****

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	39.33	NOT SUIT					
ASPHALT B (P. OF M.)	34.33	NOT SUIT					
ASPHALT C (P. OF M.)	65.56	NOT SUIT					
BASE COURSE A (P. OF M.)	28.45	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	29.19	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	1.89	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	13.05	MARGINAL	YES		YES		
SUB-BASE/BASE COURSE B (ASTM D1241)	24.37	MARGINAL	YES	YES	YES		
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	46.64	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	63.90	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	61.90	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	103.90	NOT SUIT					
TRAFFIC GRAVEL A (P. OF M.)	25.05	MARGINAL	YES	YES			
TRAFFIC GRAVEL B (P. OF M.)	25.05	MARGINAL	YES	YES			
TRAFFIC GRAVEL C (P. OF M.)	14.90	MARGINAL	YES				
TRAFFIC GRAVEL D (P. OF M.)	4.30	MARGINAL	YES				
SEAL COAT A (P. OF M.)	15.93	MARGINAL	YES		YES		
SEAL COAT B (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33,D448)	212.55	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33,D448)	202.35	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33,D448)	198.69	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,D448)	189.03	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,D448)	114.44	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	185.38	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,D448)	97.98	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,D448)	97.77	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,D448)	174.70	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,D448)	154.31	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,D448)	63.57	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,D448)	123.60	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,D448)	61.54	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,D448)	32.32	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,D448)	62.38	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,D448)	35.87	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,D448)	5.42	MARGINAL	YES				YES
COARSE AGGREGATE 9 (ASTM C33,D448)	33.34	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,D448)	37.11	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	76.98	NOT SUIT					
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	159.30	NOT SUIT					
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	139.42	NOT SUIT					
MORTAR (ASTM C144)	163.74	NOT SUIT					
PORTLAND CEMENT (P.C.A.)	557.74	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	133.30	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	51.33	NOT SUIT					
PIT RUN (P. OF M.)	10.78	MARGINAL	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE					
SHOULDERS (P. OF M.)	21.27	MARGINAL			YES		
	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003907 01407E31SWEN618A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 2737.70 GMS. WASHED SAMPLE - WEIGHT BEFORE 729.80 AFTER 717.80 % LOSS 1.64

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		278.90	8.13	91.87	8.13
1 IN		298.50	8.70	83.18	16.82
3/4 IN		117.10	3.41	79.77	20.23
5/8 IN		0.0	0.0	79.77	20.23
1/2 IN	0.0	99.78	2.91	76.86	23.14
3/8 IN	26.60	116.20	3.39	73.47	26.53
1/4 IN	51.00	134.69	3.93	69.54	30.46
# 4	51.90	99.41	2.90	66.64	33.36
# 8	26.50	354.12	10.32	56.32	43.68
# 10	54.40	141.05	4.11	52.21	47.79
# 16	37.60	178.56	5.20	47.01	52.99
# 30	47.60	292.22	8.51	38.50	61.50
# 40	264.50	359.00	10.46	28.04	71.96
# 50	95.70	96.41	2.81	25.23	74.77
# 80	25.70	40.89	1.19	24.04	75.96
# 100	10.90	4.88	0.14	23.90	76.10
# 200	1.30	15.38	0.45	23.45	76.55
<200 + W	4.10	45.02	1.31	22.14	77.86
	12.00			0.0	100.00

TOTALS 729.80 3432.20

SPLITTING FACTOR 3.75

FINENESS MODULUS 4.69

% COBBLES 0.0 % PEBBLES 35.10 % GRANULES 14.43 % SAND 49.16 % SILT/CLAY 1.31

INDUSTRIAL USAGE ASSESSMENT

003907 01407E31SWEN618A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	29.71	MARGINAL	YES	YES	YES		YES
ASPHALT B (P. OF M.)	17.90	MARGINAL	YES	YES	YES		YES
ASPHALT C (P. OF M.)	45.57	NOT SUIT					
BASE COURSE A (P. OF M.)	33.60	NOT SUIT					
BASE COURSE B (P. OF M.)	11.15	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	2.69	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	31.63	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	23.19	MARGINAL	YES	YES	YES		YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	38.17	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	26.33	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	17.53	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	39.53	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	54.95	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	34.95	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	19.05	MARGINAL	YES		YES		YES
TRAFFIC GRAVEL (P. OF M.)	8.05	MARGINAL	YES		YES		
SEAL COAT A (P. OF M.)	97.04	NOT SUIT					
SEAL COAT B (P. OF M.)	14.44	MARGINAL	YES		YES		
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33,0448)	191.95	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33,0448)	181.95	NOT SUIT					
COARSE AGGREGATE 34 (ASTM C33,0448)	173.01	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,0448)	192.22	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,0448)	120.55	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,0448)	161.79	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,0448)	116.57	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,0448)	180.67	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,0448)	191.51	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,0448)	143.60	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,0448)	184.34	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,0448)	192.56	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,0448)	191.28	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,0448)	155.55	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,0448)	184.50	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,0448)	170.07	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,0448)	120.07	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33,0448)	84.70	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,0448)	0.39	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	7.45	MARGINAL	YES				
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	20.69	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	30.92	NOT SUIT					
MORTAR (ASTM C144)	10.90	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	10.28	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	153.05	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	13.04	MARGINAL	YES		YES		YES
PIT RUN (P. OF M.)	0.0	SUITABLE	YES		YES		
SEPTIC FIELDS (U.M.A.)	16.62	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003908 01406E13NWEN619A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3430.90 GMS. WASHED SAMPLE - WEIGHT BEFORE 684.20 AFTER 663.40 % LOSS 3.04

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		153.50	3.42	96.58	3.42
1 1/2 IN		0.0	0.0	96.58	3.42
1 IN		473.90	10.56	86.02	13.98
3/4 IN		445.50	9.93	76.10	23.90
5/8 IN	8.00	40.12	0.89	75.20	24.80
1/2 IN	45.90	230.16	5.13	70.07	29.93
3/8 IN	74.60	374.08	8.33	61.74	38.26
1/4 IN	67.90	340.48	7.59	54.15	45.85
# 4	43.10	216.12	4.82	49.34	50.66
# 8	102.60	514.48	11.46	37.87	62.13
# 10	29.50	147.93	3.30	34.58	65.42
# 16	49.20	246.71	5.50	29.08	70.92
# 30	106.30	533.04	11.88	17.21	82.79
# 40	64.20	321.93	7.17	10.03	89.97
# 50	30.50	152.94	3.41	6.63	93.37
# 80	19.00	95.27	2.12	4.50	95.50
# 100	3.70	18.55	0.41	4.09	95.91
# 200	15.90	79.73	1.78	2.31	97.69
<200 + W	20.71	103.83	2.31	0.0	100.00
TOTALS	681.11	4488.27			

SPLITTING FACTOR 5.01

FINENESS MODULUS 5.21

% COBBLES 0.0 % PEBBLES 50.66 % GRANULES 14.76 % SAND 32.27 % SILT/CLAY 2.31

INDUSTRIAL USAGE ASSESSMENT

003908 01406E13NWEN619A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	1.81	MARGINAL	YES				
ASPHALT B (P. OF M.)	0.0	SUITABLE	YES				
ASPHALT C (P. OF M.)	52.86	NOT SUIT					
BASE COURSE A (P. OF M.)	6.78	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	9.22	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	1.60	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	0.0	SUITABLE	YES				
SUB-BASE/BASE COURSE B (ASTM D1241)	7.22	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	5.65	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	10.65	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	11.65	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	51.09	NOT SUIT		YES			
TRAFFIC GRAVEL A (P. OF M.)	12.32	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL B (P. OF M.)	7.05	MARGINAL	YES	YES	YES		
TRAFFIC GRAVEL C (P. OF M.)	6.54	MARGINAL	YES				
TRAFFIC GRAVEL D (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT A (P. OF M.)	76.67	NOT SUIT					
SEAL COAT B (P. OF M.)	0.41	MARGINAL	YES		YES		
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33,D448)	193.99	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33,D448)	180.57	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33,D448)	169.06	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,D448)	163.99	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,D448)	101.75	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	158.18	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,D448)	90.20	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,D448)	147.60	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,D448)	138.68	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,D448)	95.19	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,D448)	138.82	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,D448)	104.38	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,D448)	105.19	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,D448)	107.48	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,D448)	121.00	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,D448)	123.26	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,D448)	79.61	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33,D448)	72.02	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,D448)	11.21	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	11.21	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	32.22	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	36.94	NOT SUIT					
MORTAR (ASTM C144)	20.99	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	18.23	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	13.74	MARGINAL	YES				
AIRFIELD RUNWAYS (P. OF M.)	108.28	NOT SUIT					
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES				
SHOULDERS (P. OF M.)	8.79	MARGINAL	YES		YES		
	0.0	SUITABLE	YES				

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003909 01407E18SWEN546A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 3999.60 GMS. WASHED SAMPLE - WEIGHT BEFORE 927.30 AFTER 901.50 % LOSS 2.78

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		692.50	11.46	88.54	11.46
1 1/2 IN		748.80	12.39	76.15	23.85
1 IN		283.70	4.69	71.46	28.54
3/4 IN		323.60	5.35	66.10	33.90
5/8 IN	20.90	90.15	1.49	64.61	35.39
1/2 IN	30.40	131.15	2.17	62.44	37.56
3/8 IN	83.70	321.01	5.97	56.47	43.53
1/4 IN	62.80	270.89	4.48	51.99	48.01
#4	48.90	210.91	3.49	48.50	51.50
#8	115.90	498.17	8.24	40.26	59.74
#10	43.30	186.79	3.09	37.16	62.84
#16	109.20	471.00	7.79	29.38	70.62
#30	162.30	700.03	11.58	17.79	82.21
#40	78.00	336.43	5.57	12.22	87.78
#50	61.00	263.10	4.35	7.87	92.13
#60	65.90	284.24	4.70	3.17	96.83
#100	9.20	39.68	0.66	2.51	97.49
#200	9.49	40.54	0.67	1.84	98.16
<200 + M	25.77	111.16	1.84	0.0	100.00
TOTALS	926.27	6043.74			

SPLITTING FACTOR 4.31

FINENESS MODULUS 5.55

% COBBLES 0.0 % PEBBLES 51.50 % GRANULES 11.33 % SAND 35.33 % SILT/CLAY 1.84

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INDUSTRIAL USAGE ASSESSMENT

003909 01407E18SWEN546A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	4.59	MARGINAL	YES				
ASPHALT B (P. OF M.)	11.52	MARGINAL	YES		YES		
ASPHALT C (P. OF M.)	48.94	NOT SUIT					YES
BASE COURSE A (P. OF M.)	9.81	MARGINAL	YES				YES
BASE COURSE B (P. OF M.)	1.59	MARGINAL	YES	YES	YES		
BASE COURSE C (P. OF M.)	1.97	MARGINAL	YES	YES			YES
SUB-BASE/BASE COURSE A (ASTM D1241)	1.92	MARGINAL	YES				
SUB-BASE/BASE COURSE B (ASTM D1241)	4.12	MARGINAL	YES				
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	7.50	MARGINAL	YES	YES			YES
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	13.50	MARGINAL	YES	YES	YES		
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	15.32	MARGINAL	YES	YES			YES
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	23.44	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	34.27	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	14.27	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL C (P. OF M.)	2.49	MARGINAL	YES				
SEAL COAT A (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT B (P. OF M.)	93.95	NOT SUIT					
SEAL COAT C (P. OF M.)	13.24	MARGINAL	YES				
COARSE AGGREGATE 1 (ASTM C33,D448)	6.64	SUITABLE	YES		YES		YES
COARSE AGGREGATE 2 (ASTM C33,D448)	163.10	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33,D448)	141.64	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,D448)	130.54	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,D448)	122.35	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	94.70	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,D448)	149.21	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,D448)	98.54	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,D448)	174.37	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,D448)	178.06	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,D448)	126.13	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,D448)	160.85	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,D448)	134.80	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,D448)	140.90	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,D448)	131.47	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,D448)	150.90	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,D448)	146.12	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33,D448)	103.45	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,D448)	84.46	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	7.81	MARGINAL	YES				
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	4.12	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	17.83	MARGINAL	YES				YES
MORTAR (ASTM C144)	12.00	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	12.09	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	4.12	MARGINAL	YES				
AIRFIELD RUNWAYS (P. OF M.)	131.65	NOT SUIT					
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES				
SHOULDERS (P. OF M.)	16.80	MARGINAL	YES				
	0.0	SUITABLE	YES		YES		

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003913 01407E13NEEN557A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 2627.30 GMS. WASHED SAMPLE - WEIGHT BEFORE 736.60 AFTER 719.30 % LOSS 2.35

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		525.40	12.68	87.12	12.88
1 1/2 IN		486.10	11.73	75.39	24.61
1 IN		348.90	8.42	66.97	33.03
3/4 IN		393.60	9.50	57.47	42.53
5/8 IN	46.30	165.14	4.05	53.42	46.58
1/2 IN	84.10	299.97	7.35	46.07	53.93
3/8 IN	136.40	486.51	11.92	34.15	65.85
1/4 IN	123.20	439.43	10.77	23.38	76.62
# 4	44.50	158.72	3.89	19.49	80.51
# 8	132.00	470.85	11.54	7.95	92.05
# 10	36.90	131.61	3.23	4.72	95.28
# 16	43.10	153.73	3.77	0.95	99.05
# 30	42.10	150.16	3.68	4.37	95.63
# 40	9.20	32.81	0.80	3.57	96.43
# 50	5.70	20.33	0.50	3.07	96.93
# 60	8.80	31.38	0.77	2.30	97.70
# 100	2.50	8.92	0.22	2.08	97.92
# 200	6.20	22.11	0.54	1.54	98.46
<200 + W	17.29	61.68	1.51	0.0	100.00
TOTALS	736.29	4080.20			

SPLITTING FACTOR 3.57

FINENESS MODULUS 6.54

% COBBLES 0.0 % PEBBLES 73.62 % GRANULES 14.76 % SAND 10.11 % SILT/CLAY 1.51

I N D U S T R I A L U S A G E A S S E S S M E N T

003913 01407E13NEEN557A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	42.99	NOT SUIT					
ASPHALT B (P. OF M.)	38.70	NOT SUIT					
ASPHALT C (P. OF M.)	28.70	NOT SUIT					
BASE COURSE A (P. OF M.)	63.92	NOT SUIT					
BASE COURSE B (P. OF M.)	22.10	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	26.86	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	2.29	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE B (ASTM D1241)	2.97	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	20.87	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	24.48	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	69.38	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	62.83	NOT SUIT					
TRAFFIC GRAVEL A (P. OF M.)	104.83	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	21.11	MARGINAL	YES	YES			
TRAFFIC GRAVEL C (P. OF M.)	21.11	MARGINAL	YES	YES			
TRAFFIC GRAVEL D (P. OF M.)	21.91	MARGINAL	YES				
SEAL COAT A (P. OF M.)	2.29	MARGINAL	YES				
SEAL COAT B (P. OF M.)	33.67	NOT SUIT					
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 3 (ASTM C33;D448)	0.0	SUITABLE	YES				
COARSE AGGREGATE 3 (ASTM C33;D448)	167.44	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	144.56	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	125.40	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	122.93	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	39.75	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	124.97	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	47.74	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	123.01	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	94.96	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	45.67	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	91.74	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	45.53	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	30.38	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	23.11	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	22.10	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	57.02	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	19.93	MARGINAL	YES				
COARSE AGGREGATE 10 (ASTM C33;D448)	34.94	NOT SUIT					YES
FINE CONCRETE AGGREGATE (P. OF M.)	28.40	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE 1 (ASTM C33; C404)	59.37	NOT SUIT					
FINE CONCRETE AGGREGATE 2 (ASTM C33; C404)	122.99	NOT SUIT					
MORTAR (ASTM C144)	52.28	NOT SUIT					
PORTLAND CEMENT (P.C.A.)	16.94	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	97.66	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	53.61	NOT SUIT					
PIT RUN (P. OF M.)	6.52	MARGINAL	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES				
SHOULDERS (P. OF M.)	7.96	MARGINAL	YES		YES		
	0.0	SUITABLE	YES				

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003914 01407E055EEN584A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3934.30 GMS. WASHED SAMPLE - WEIGHT BEFORE 898.60 AFTER 885.00 % LOSS 1.51

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		420.90	10.69	89.40	10.60
1 1/2 IN		391.00	9.94	85.50	14.50
1 IN		834.00	10.01	75.49	24.51
3/4 IN		588.70	9.20	66.30	33.70
1/2 IN	40.00	772.53	1.92	59.45	40.55
3/8 IN	49.00	814.53	1.62	53.73	46.27
1/4 IN	50.30	594.09	1.28	50.28	49.72
#4	78.80	441.69	2.09	46.40	53.60
#8	41.90	183.45	0.91	44.49	55.51
#16	115.60	306.13	0.51	43.97	56.03
#30	24.60	152.46	0.57	43.40	56.60
#40	47.00	205.78	0.47	43.04	56.96
#50	183.70	604.22	13.56	18.28	81.72
#80	81.40	326.02	0.47	17.81	82.19
#100	84.90	240.19	0.47	17.34	82.66
#200	60.90	262.84	0.49	16.85	83.15
<200 + W	13.60	59.54	1.00	0.0	100.00
TOTALS	898.60	5934.28			

SPLITTING FACTOR 4.38

FINENESS MODULUS 5.51

% COBBLES 0.0 % PEBBLES 53.60 % GRANULES 11.10 % SAND 34.30 % SILT/CLAY 1.00

INDUSTRIAL USAGE ASSESSMENT

003914 01407E055EEN584A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	0.49	MARGINAL	YES	YES			
ASPHALT B (P. OF M.)	0.49	MARGINAL	YES	YES			
ASPHALT C (P. OF M.)	52.37	NOT SUIT					
BASE COURSE A (P. OF M.)	0.49	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	2.66	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	2.66	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	0.35	MARGINAL	YES	YES			
SUB-BASE/BASE COURSE B (ASTM D1241)	8.33	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	3.67	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	15.62	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	9.06	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	37.02	NOT SUIT					
TRAFFIC GRAVEL A (P. OF M.)	24.82	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL B (P. OF M.)	9.88	MARGINAL	YES	YES	YES		
TRAFFIC GRAVEL C (P. OF M.)	7.16	MARGINAL	YES				
TRAFFIC GRAVEL D (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT A (P. OF M.)	87.79	NOT SUIT					
SEAL COAT B (P. OF M.)	12.96	MARGINAL	YES		YES		YES
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33;D448)	174.80	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	142.63	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	131.52	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	82.23	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	145.57	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	83.03	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	142.53	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	138.20	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	100.89	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	141.92	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	117.56	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	124.53	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	121.01	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	144.03	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	150.09	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	102.42	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	84.52	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	9.98	MARGINAL	YES				
COARSE AGGREGATE 10 (ASTM C33;D448)	0.0	SUITABLE	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	6.27	MARGINAL	YES				
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	22.56	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	14.63	MARGINAL	YES				
MORTAR (ASTM C144)	13.35	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	8.07	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	121.51	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	0.0	SUITABLE	YES				
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	7.24	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	0.0	SUITABLE	YES				

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003916 01307E21NWEN570A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3342.40 GMS. WASHED SAMPLE - WEIGHT BEFORE 923.70 AFTER 902.00 % LOSS 2.35

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		88.10	2.39	97.61	2.39
3/4 IN		288.90	7.84	89.77	7.84
5/8 IN	45.70	333.90	9.06	80.71	9.06
1/2 IN	43.10	377.00	10.23	70.48	10.23
3/8 IN	131.10	508.10	13.79	56.69	13.79
1/4 IN	102.20	610.30	16.56	40.13	16.56
# 4	88.40	698.70	18.96	21.17	18.96
# 8	80.40	779.10	21.14	0.03	21.14
# 10	80.20	859.30	23.32	0.0	23.32
# 16	31.90	891.20	24.18	0.0	24.18
# 30	126.40	1017.60	27.61	0.0	27.61
# 40	93.70	1111.30	30.15	0.0	30.15
# 50	83.10	1194.40	32.41	0.0	32.41
# 80	64.40	1258.80	34.16	0.0	34.16
# 100	9.20	1268.00	34.41	0.0	34.41
# 200	3.20	1271.20	34.49	0.0	34.49
<200 + W	21.70	78.52	2.13	0.0	100.00
TOTALS	923.70	3689.10			

SPLITTING FACTOR 3.62

FINENESS MODULUS 4.66

% COBBLES 0.0 % PEBBLES 47.41 % GRANULES 10.46 % SAND 40.01 % SILT/CLAY 2.13

INDUSTRIAL USAGE ASSESSMENT

003916 01307E21NWEN570A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	0.0	SUITABLE	YES				
ASPHALT B (P. OF M.)	0.0	SUITABLE	YES				
ASPHALT C (P. OF M.)	43.63	NOT SUIT					
BASE COURSE A (P. OF M.)	5.63	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	1.07	MARGINAL		YES			
BASE COURSE C (P. OF M.)	1.07	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	1.07	MARGINAL		YES			
SUB-BASE/BASE COURSE B (ASTM D1241)	2.09	MARGINAL			YES		YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	2.63	MARGINAL		YES	YES		
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	11.02	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	1.04	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	48.63	NOT SUIT	YES				
TRAFFIC GRAVEL A (P. OF M.)	2.13	MARGINAL	YES	YES			
TRAFFIC GRAVEL B (P. OF M.)	2.08	MARGINAL	YES	YES			YES
TRAFFIC GRAVEL C (P. OF M.)	2.13	MARGINAL	YES				
SEAL COAT A (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT B (P. OF M.)	72.52	NOT SUIT					
SEAL COAT C (P. OF M.)	2.05	MARGINAL	YES				YES
COARSE AGGREGATE 1 (ASTM C33;D448)	0	SUITABLE	YES				
COARSE AGGREGATE 2 (ASTM C33;D448)	211.13	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	201.23	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	196.79	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	186.79	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	174.50	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	164.50	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	154.50	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	149.50	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	142.11	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	134.89	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	119.44	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	93.28	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	105.37	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	4.28	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	111.68	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	124.29	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	88.85	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	91.20	NOT SUIT					
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	2.58	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	2.50	MARGINAL	YES				
MORTAR (ASTM C144)	10.31	NOT SUIT					
PORTLAND CEMENT (P.C.A.)	2.93	MARGINAL	YES				
BUTTER-UP SCOOPS (ASTM D1863)	2.58	MARGINAL	YES				
AIRFIELD RUNWAYS (P. OF M.)	48.58	NOT SUIT					
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE					
SHOULDERS (P. OF M.)	20.66	MARGINAL				YES	
	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003917 01306E23NWEN586A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 2621.80 GMS. WASHED SAMPLE - WEIGHT BEFORE 700.90 AFTER 667.50 % LOSS 4.77

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		305.00	9.58	90.42	9.58
1 1/2 IN		0.0	0.0	90.42	9.58
1 IN		152.10	4.78	85.64	14.33
3/4 IN		145.00	4.55	81.09	18.88
5/8 IN	12.20	45.00	1.41	80.34	19.66
1/2 IN	44.50	130.55	4.10	76.24	23.77
3/8 IN	61.30	220.30	7.31	69.03	30.97
1/4 IN	71.00	268.95	8.45	60.58	39.42
# 4	58.00	216.90	6.82	53.76	46.24
# 8	166.90	959.31	15.05	34.14	65.86
#10	47.40	181.34	2.57	28.57	71.43
#16	49.60	191.24	2.71	25.86	74.14
#30	99.90	344.50	10.93	14.94	85.06
#40	28.40	96.01	2.96	11.98	88.02
#50	13.20	45.36	1.55	9.40	90.60
#80	16.30	60.97	1.92	5.48	94.52
#100	2.70	10.10	0.35	5.13	94.87
#200	10.60	40.40	1.37	3.90	96.10
<200 + W	33.15	124.00	3.90	0.0	100.00
TOTALS	695.65	3182.26			

SPLITTING FACTOR 3.74

FINENESS MODULUS 5.24

% COBBLES 0.0 % PEBBLES 46.24 % GRANULES 25.19 % SAND 24.67 % SILT/CLAY 3.90

INDUSTRIAL USAGE ASSESSMENT

003917 01306E23NWEN586A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	4.12	MARGINAL	YES				
ASPHALT B (P. OF M.)	0.06	MARGINAL	YES				
ASPHALT C (P. OF M.)	52.58	NOT SUIT					
BASE COURSE A (P. OF M.)	2.10	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	2.10	MARGINAL	YES				
BASE COURSE C (P. OF M.)	0.0	SUITABLE	YES				
SUB-BASE/BASE COURSE A (ASTM D1241)	15.80	MARGINAL	YES				
SUB-BASE/BASE COURSE B (ASTM D1241)	2.14	MARGINAL	YES		YES		
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	5.00	MARGINAL	YES	YES	YES		
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	24.65	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	17.85	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	51.90	NOT SUIT					
TRAFFIC GRAVEL A (P. OF M.)	12.21	MARGINAL	YES	YES	YES		
TRAFFIC GRAVEL B (P. OF M.)	0.66	MARGINAL	YES	YES	YES		
TRAFFIC GRAVEL C (P. OF M.)	0.0	SUITABLE	YES				
TRAFFIC GRAVEL D (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT A (P. OF M.)	6.91	NOT SUIT					
SEAL COAT B (P. OF M.)	1.93	MARGINAL	YES		YES		YES
SEAL COAT C (P. OF M.)	1.93	MARGINAL	YES				YES
COARSE AGGREGATE 1 (ASTM C33;D448)	198.11	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	175.00	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	176.21	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	169.14	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	169.64	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	124.55	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	104.51	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	103.07	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	100.69	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	100.97	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	109.71	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	108.47	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	105.66	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	106.63	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	104.90	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	59.10	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	50.96	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	44.28	MARGINAL	YES				YES
COARSE AGGREGATE 10 (ASTM C33;D448)	41.98	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	72.50	NOT SUIT					
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	65.26	NOT SUIT					
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	31.49	NOT SUIT					
MORTAR (ASTM C144)	48.90	NOT SUIT					
PORTLAND CEMENT (P. C.A.)	106.18	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	0.0	SUITABLE	YES				
AIRFIELD RUNWAYS (P. OF M.)	0.0	SUITABLE	YES				
PIT RUN (P. OF M.)	20.44	MARGINAL	YES		YES		
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES				
SHOULDERS (P. OF M.)							

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003918 01306E22SWEN528A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 614.10 GMS. WASHED SAMPLE - WEIGHT BEFORE 614.10 AFTER 606.98 % LOSS 1.17

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		0.0	0.0	100.00	0.0
3/4 IN		0.0	0.0	100.00	0.0
5/8 IN	0.0	0.0	0.0	100.00	0.0
1/2 IN	3.40	3.40	0.55	99.45	0.55
3/8 IN	0.0	0.0	0.0	99.45	0.55
1/4 IN	3.20	3.20	0.52	98.93	1.07
#4	3.90	3.90	0.64	98.29	1.71
#6	17.50	17.50	2.88	95.41	4.59
#10	31.70	31.70	5.18	90.23	9.77
#16	75.20	75.20	12.32	77.91	22.09
#30	373.10	373.10	60.79	17.12	82.88
#40	68.50	68.50	11.04	6.08	93.92
#50	19.50	19.50	3.18	2.90	97.10
#70	11.70	11.70	1.91	0.99	99.01
#100	2.00	2.00	0.34	0.65	99.35
#200	0.20	0.20	0.04	0.61	99.39
<200 + W	7.20	7.20	1.17	0.0	100.00
TOTALS	614.10	614.10			

SPLITTING FACTOR 1.00

FINENESS MODULUS 3.01

% COBBLES 0.0 % PEBBLES 1.71 % GRANULES 8.01 % SAND 89.11 % SILT/CLAY 1.17

I N D U S T R I A L U S A G E A S S E S S M E N T

003918 01306E22SWEN528A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	76.21	NOT SUIT					
ASPHALT B (P. OF M.)	63.84	NOT SUIT					
ASPHALT C (P. OF M.)	57.44	NOT SUIT					
BASE COURSE A (P. OF M.)	72.76	NOT SUIT					
BASE COURSE B (P. OF M.)	63.79	NOT SUIT					
BASE COURSE C (P. OF M.)	57.42	NOT SUIT					
SUB-BASE/BASE COURSE A (ASTM D1241)	216.42	MARGINAL		YES		YES	
SUB-BASE/BASE COURSE B (ASTM D1241)	119.27	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	94.31	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	52.76	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	12.19	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	54.19	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	99.64	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	79.64	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	71.01	NOT SUIT					
TRAFFIC GRAVEL D (P. OF M.)	53.92	NOT SUIT					
SEAL COAT A (P. OF M.)	129.62	NOT SUIT					
SEAL COAT B (P. OF M.)	20.84	MARGINAL	YES		YES		
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 3 (ASTM C33;D448)	220.17	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	210.17	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	209.65	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	209.61	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	192.91	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	224.43	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	220.07	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	207.35	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	216.42	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	221.29	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	264.28	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	201.23	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	254.75	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	229.83	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	121.23	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	7.66	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	0.49	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	8.11	MARGINAL	YES				
MORTAR (ASTM C144)	22.80	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	0.0	SUITABLE	YES				
BUILT-UP ROOFS (ASTM D1863)	20.91	MARGINAL	YES				YES
AIRFIELD RUNWAYS (P. OF M.)	202.22	NOT SUIT					
PIT RUN (P. OF M.)	78.26	NOT SUIT					
SEPTIC FIELDS (U.M.A.)	23.29	MARGINAL				YES	
SHOULDERS (P. OF M.)	30.00	MARGINAL				YES	
	28.29	MARGINAL				YES	

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 5

SAMPLE IDENTIFICATION 003919 01306E24SWEN582A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3070.90 GMS. WASHED SAMPLE - WEIGHT BEFORE 807.30 AFTER 774.20 % LOSS 4.19

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		77.80	2.28	97.72	2.28
1 IN		100.20	2.94	94.78	5.22
3/4 IN		160.00	4.69	90.08	9.92
5/8 IN		97.90	2.87	87.20	12.80
1/2 IN	22.60	137.30	4.03	83.17	16.83
3/8 IN	41.00	139.05	4.08	79.09	20.91
1/4 IN	81.20	110.02	3.23	75.86	24.14
#4	46.70	139.60	4.10	71.76	28.24
#8	76.60	298.50	8.76	63.00	37.00
#10	20.90	79.50	2.33	60.67	39.33
#16	49.30	154.40	4.53	56.14	43.86
#30	83.40	317.20	9.30	46.84	53.16
#40	34.00	91.50	2.68	44.16	55.84
#50	27.30	65.91	1.93	42.23	57.77
#80	204.20	770.70	22.61	19.62	80.38
#100	43.60	165.88	4.87	14.75	85.25
#200	50.00	162.50	4.76	9.99	90.01
<200 + M	33.10	125.91	3.69	6.30	93.70
				0.0	100.00
TOTALS	807.30	3408.90			

SPLITTING FACTOR 3.80

FINENESS MODULUS 3.79

% COBBLES 0.0 % PEBBLES 36.69 % GRANULES 10.88 % SAND 48.74 % SILT/CLAY 3.69

I N D U S T R I A L U S A G E A S S E S S M E N T

003919 01306E24SWEN582A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	16.62	MARGINAL	YES		YES		YES
ASPHALT B (P. OF M.)	16.32	MARGINAL	YES				YES
ASPHALT C (P. OF M.)	23.07	MARGINAL	YES	YES	YES		
BASE COURSE A (P. OF M.)	20.23	MARGINAL	YES	YES			YES
BASE COURSE B (P. OF M.)	20.38	MARGINAL	YES	YES	YES		YES
BASE COURSE C (P. OF M.)	7.31	MARGINAL		YES			YES
SUB-BASE/BASE COURSE A (ASTM D1241)	5.11	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	22.43	MARGINAL		YES		YES	YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	19.23	MARGINAL	YES	YES	YES		YES
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	4.10	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	3.10	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	3.10	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	41.32	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	16.32	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL C (P. OF M.)	16.32	MARGINAL	YES				YES
TRAFFIC GRAVEL D (P. OF M.)	11.00	MARGINAL	YES				YES
SEAL COAT A (P. OF M.)	43.13	NOT SUIT					
SEAL COAT B (P. OF M.)	32.73	NOT SUIT					
SEAL COAT C (P. OF M.)	27.73	MARGINAL	YES				YES
COARSE AGGREGATE 1 (ASTM C33;D448)	210.50	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	199.30	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	169.93	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	168.33	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	168.33	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	167.06	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	167.06	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	167.93	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	6.07	MARGINAL	YES				
FINE CONCRETE AGGREGATE (P. OF M.)	26.03	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	41.04	NOT SUIT					YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	32.85	NOT SUIT					
MORTAR (ASTM C144)	8.50	MARGINAL	YES				
PORTLAND CEMENT (P. C.A.)	49.74	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	129.68	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	11.00	MARGINAL	YES				
PIT RUN (P. OF M.)	4.00	SUITABLE	YES				YES
SEPTIC FIELDS (U.S.A.)	22.19	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	8.8	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003920 01307E21SWEN568A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3140.50 GMS. WASHED SAMPLE - WEIGHT BEFORE 723.30 AFTER 683.90 % LOSS 5.45

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		116.00	3.11	96.89	3.11
1 IN		193.90	5.20	91.69	8.31
3/4 IN		276.90	7.43	84.25	15.75
5/8 IN	12.30	53.41	1.43	82.82	17.18
1/2 IN	83.30	405.10	10.87	71.95	28.05
3/8 IN	50.30	317.98	8.53	63.42	36.58
1/4 IN	57.70	293.95	7.89	55.53	44.47
# 4	20.20	225.44	6.05	49.48	50.52
# 6	16.10	130.42	3.50	45.98	54.02
# 10	20.00	66.84	1.79	44.19	55.81
# 16	23.80	103.34	2.77	41.42	58.58
# 30	42.70	185.40	4.98	36.44	63.56
# 40	30.00	130.26	3.50	32.94	67.06
# 50	79.80	346.48	9.30	23.64	76.36
# 80	131.70	571.83	15.35	8.29	91.71
# 100	10.60	46.02	1.24	7.05	92.95
# 200	4.30	18.66	0.50	6.55	93.45
<200 + W	39.39	171.02	4.59	0.0	100.00
TOTALS	723.09	3726.38			

SPLITTING FACTOR 4.34

FINENESS MODULUS 4.45

% COBBLES 0.0 % PEBBLES 45.07 % GRANULES 11.20 % SAND 39.14 % SILT/CLAY 4.59

INDUSTRIAL USAGE ASSESSMENT

003920 01307E21SWEN568A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	8.56	MARGINAL	YES				YES
ASPHALT B (P. OF M.)	8.56	MARGINAL	YES				YES
ASPHALT C (P. OF M.)	22.14	MARGINAL	YES				YES
BASE COURSE A (P. OF M.)	11.11	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	0.0	SUITABLE	YES				
BASE COURSE C (P. OF M.)	0.0	SUITABLE					
SUB-BASE/BASE COURSE A (ASTM D1241)	17.31	MARGINAL				YES	YES
SUB-BASE/BASE COURSE B (ASTM D1241)	7.89	MARGINAL		YES			YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	5.45	MARGINAL	YES				YES
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	2.99	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	0.99	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	20.39	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	23.20	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL B (P. OF M.)	8.84	MARGINAL	YES	YES			YES
TRAFFIC GRAVEL C (P. OF M.)	8.84	MARGINAL	YES				YES
TRAFFIC GRAVEL D (P. OF M.)	5.43	MARGINAL	YES				
SEAL COAT A (P. OF M.)	93.19	NOT SUIT					
SEAL COAT B (P. OF M.)	38.67	NOT SUIT					YES
SEAL COAT C (P. OF M.)	22.51	MARGINAL	YES				
COARSE AGGREGATE 1 (ASTM C33-D448)	204.73	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33-D448)	194.77	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33-D448)	161.68	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33-D448)	174.01	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33-D448)	117.15	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33-D448)	170.63	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33-D448)	103.87	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33-D448)	183.16	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33-D448)	137.87	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33-D448)	107.60	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33-D448)	179.48	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33-D448)	116.24	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33-D448)	125.91	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33-D448)	117.36	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33-D448)	140.97	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33-D448)	157.66	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33-D448)	119.58	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33-D448)	119.57	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33-D448)	7.86	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	15.43	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	25.25	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	21.71	MARGINAL	YES				
MORTAR (ASTM C144)	11.14	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	133.35	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	117.65	NOT SUIT					YES
AIRFIELD RUNWAYS (P. OF M.)	5.43	MARGINAL	YES				
PIT RUN (P. OF M.)	0.0	SUITABLE	YES		YES		
SEPTIC FIELDS (U.M.A.)	16.96	MARGINAL	YES				
SHOULDERS (P. OF M.)	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003921 01307E16SWEN566A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 2624.10 GMS. WASHED SAMPLE - WEIGHT BEFORE 886.00 AFTER 878.50 % LOSS 0.85

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		230.00	7.43	92.57	7.43
1 IN		192.20	6.21	86.35	13.65
3/4 IN		46.20	1.56	84.80	15.20
5/8 IN	46.00	136.24	4.40	80.39	19.61
1/2 IN	15.30	45.31	1.49	78.93	21.07
3/8 IN	82.70	244.04	7.91	71.01	28.99
1/4 IN	75.40	223.31	7.22	63.80	36.20
# 4	33.40	98.88	3.20	60.60	39.40
# 8	93.20	276.03	8.92	51.68	48.32
# 10	26.30	77.89	2.52	49.16	50.84
# 16	43.00	127.35	4.12	45.04	54.96
# 30	97.20	287.88	9.30	35.74	64.26
# 40	38.20	113.14	3.66	32.07	67.93
# 50	52.00	154.01	4.98	27.11	72.89
# 80	194.80	576.95	18.64	8.47	91.53
# 100	49.80	147.49	4.77	3.70	96.30
# 200	31.20	92.41	2.99	0.72	99.28
<200 + W	7.50	22.21	0.72	0.0	100.00
TOTALS	886.00	3094.60			

SPLITTING FACTOR 2.96

FINENESS MODULUS 4.28

% COBBLES 0.0 % PEBBLES 39.40 % GRANULES 11.44 % SAND 48.45 % SILT/CLAY 0.72

INDUSTRIAL USAGE ASSESSMENT

003921 01307E16SWEN566A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	13.44	MARGINAL	YES	YES	YES		YES
ASPHALT B (P. OF M.)	11.96	MARGINAL	YES	YES			YES
ASPHALT C (P. OF M.)	26.32	MARGINAL	YES	YES			YES
BASE COURSE A (P. OF M.)	19.44	MARGINAL	YES	YES	YES		YES
BASE COURSE B (P. OF M.)	3.22	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	3.58	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	34.68	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	11.14	MARGINAL		YES	YES		
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	23.44	MARGINAL	YES	YES	YES		YES
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	7.17	MARGINAL	YES	YES			YES
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	5.17	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	5.17	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	47.87	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	15.53	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL C (P. OF M.)	17.53	MARGINAL	YES		YES		YES
TRAFFIC GRAVEL D (P. OF M.)	5.68	MARGINAL	YES		YES		YES
SEAL COAT A (P. OF M.)	7.44	MARGINAL	YES		YES		YES
SEAL COAT B (P. OF M.)	94.57	NOT SUIT					
SEAL COAT C (P. OF M.)	32.44	NOT SUIT					
COARSE AGGREGATE 1 (ASTM C33;D448)	15.44	MARGINAL	YES				YES
COARSE AGGREGATE 2 (ASTM C33;D448)	107.44	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	101.28	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	101.85	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	120.68	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	113.24	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	167.16	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	113.84	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	183.59	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	169.08	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	113.89	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	164.89	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	143.22	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	159.43	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	169.16	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	182.69	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	194.33	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	118.48	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	4.80	MARGINAL	YES				
FINE CONCRETE AGGREGATE (P. OF M.)	12.84	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	35.07	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	13.46	MARGINAL	YES				YES
MORTAR (ASTM C144)	9.72	MARGINAL	YES				YES
PORTLAND CEMENT (P.C.A.)	0.0	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	28.10	MARGINAL	YES				YES
AIRFIELD RUNWAYS (P. OF M.)	126.24	NOT SUIT					
PIT RUN (P. OF M.)	8.07	MARGINAL	YES		YES		YES
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES		YES		
SHOULDERS (P. OF M.)	21.60	MARGINAL	YES		YES		
	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003923 01207E32SEEN564A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 2671.20 GMS. WASHED SAMPLE - WEIGHT BEFORE 723.10 AFTER 692.60 % LOSS 4.22

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		94.10	2.95	94.98	5.02
1 IN		320.20	10.05	84.91	13.09
3/4 IN		92.70	2.91	82.00	16.01
5/8 IN	13.00	45.02	1.51	80.48	19.53
1/2 IN	33.90	125.23	4.24	76.25	23.76
3/8 IN	22.10	81.64	2.57	73.68	26.32
1/4 IN	42.60	157.37	4.95	71.03	28.97
# 4	31.00	114.53	3.64	67.39	32.64
# 8	31.10	114.90	3.61	63.78	36.29
# 10	31.10	114.89	3.61	60.18	39.90
# 16	44.60	164.76	5.18	54.91	45.09
# 30	89.00	317.69	9.99	44.92	55.08
# 40	33.00	121.91	3.83	41.09	58.91
# 50	41.60	153.67	4.83	36.26	63.74
# 80	117.90	435.55	13.70	22.56	77.44
# 100	41.30	152.52	4.80	17.76	82.23
# 200	70.80	261.54	8.22	9.54	90.46
<200 + W	30.50	112.67	3.54	0.0	100.00
TOTALS	723.10	3180.20			

SPLITTING FACTOR 3.69

FINENESS MODULUS 3.88

% COBBLES 0.0 % PEBBLES 32.64 % GRANULES 13.27 % SAND 50.55 % SILT/CLAY 3.54

INDUSTRIAL USAGE ASSESSMENT

003923 01207E32SEEN564A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	31.84	NOT SUIT					
ASPHALT B (P. OF M.)	45.36	MARGINAL	YES		YES		YES
ASPHALT C (P. OF M.)	35.26	MARGINAL	YES	YES			
BASE COURSE A (P. OF M.)	35.16	NOT SUIT					
BASE COURSE B (P. OF M.)	47.53	MARGINAL	YES	YES			YES
BASE COURSE C (P. OF M.)	0.45	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	52.53	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	33.08	MARGINAL		YES		YES	YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	36.47	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	3.92	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	3.92	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	3.92	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	56.67	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	53.67	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	20.50	MARGINAL	YES		YES		YES
TRAFFIC GRAVEL D (P. OF M.)	17.88	MARGINAL	YES		YES		YES
SEAL COAT A (P. OF M.)	101.52	NOT SUIT					
SEAL COAT B (P. OF M.)	48.36	NOT SUIT					
SEAL COAT C (P. OF M.)	20.10	MARGINAL	YES				YES
COARSE AGGREGATE 3 (ASTM C33,D448)	201.82	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,D448)	193.55	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33,D448)	187.05	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	174.98	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,D448)	170.36	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	174.43	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,D448)	164.88	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,D448)	178.41	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,D448)	183.45	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,D448)	143.00	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,D448)	183.38	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,D448)	164.41	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,D448)	185.69	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,D448)	152.56	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,D448)	185.81	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,D448)	189.01	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,D448)	191.54	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33,D448)	152.82	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,D448)	13.66	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	13.33	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	15.78	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	21.96	MARGINAL	YES				YES
MORTAR (ASTM C144)	3.92	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	35.52	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	155.08	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	24.13	MARGINAL	YES		YES		YES
PIT RUN (P. OF M.)	0.0	SUITABLE	YES		YES		
SEPTIC FIELDS (U.M.A.)	16.61	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003924 01207E36SWEN608A
AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE
WEIGHT OF SAND 4811.30 GMS. WASHED SAMPLE - WEIGHT BEFORE 848.00 AFTER 831.50 % LOSS 1.95

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		122.40	2.25	97.75	2.25
1 IN		207.10	3.80	93.95	6.05
3/4 IN		309.60	5.68	88.27	11.73
5/8 IN	42.70	242.27	4.44	83.83	16.17
1/2 IN	35.60	315.66	5.79	78.04	21.96
3/8 IN	62.40	324.04	5.50	74.78	25.22
1/4 IN	74.60	253.56	4.77	69.78	30.22
#4	151.00	615.19	11.31	61.48	38.52
#8	107.90	599.02	11.00	43.83	56.17
#10	24.20	104.68	1.92	41.91	58.09
#16	24.40	103.39	1.90	40.01	59.99
#30	65.70	107.44	1.97	38.04	61.96
#40	34.80	107.37	1.97	36.07	63.93
#50	39.50	467.37	8.58	27.49	72.51
#80	157.90	253.34	4.65	22.84	77.16
#100	39.90	159.89	2.93	19.91	80.09
#200	37.30	104.59	1.92	17.99	82.01
<200 + M	16.50	93.62	1.72	16.28	83.72
TOTALS	848.00	5450.38			

SPLITTING FACTOR 5.67
FINENESS MODULUS 4.42
% COBBLES 0.0 % PEBBLES 41.59 % GRANULES 14.48 % SAND 42.21 % SILT/CLAY 1.72

I N D U S T R I A L U S A G E A S S E S S M E N T

003924 01207E36SWEN608A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	0.09	MARGINAL	YES	YES			
ASPHALT B (P. OF M.)	0.05	MARGINAL	YES	YES			
ASPHALT C (P. OF M.)	33.84	NOT SUIT					
BASE COURSE A (P. OF M.)	0.05	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	3.24	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	3.28	MARGINAL		YES		YES	YES
SUB-BASE/BASE COURSE A (ASTM D1241)	19.65	MARGINAL		YES			
SUB-BASE/BASE COURSE B (ASTM D1241)	3.99	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	3.99	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	4.17	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	4.17	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	25.13	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL A (P. OF M.)	14.84	MARGINAL	YES	YES			
TRAFFIC GRAVEL B (P. OF M.)	0.05	MARGINAL	YES				
TRAFFIC GRAVEL C (P. OF M.)	0.05	MARGINAL	YES				
TRAFFIC GRAVEL D (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT A (P. OF M.)	82.04	NOT SUIT			YES		YES
SEAL COAT B (P. OF M.)	22.50	MARGINAL	YES				YES
SEAL COAT C (P. OF M.)	4.28	MARGINAL	YES				
COARSE AGGREGATE 1 (ASTM C33;D448)	209.28	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	196.28	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	189.72	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	180.47	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	178.12	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	176.24	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	173.93	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	176.08	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	173.73	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	173.00	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	167.91	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	179.99	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	175.69	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	181.63	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	180.82	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	176.42	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	180.01	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	7.18	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	9.78	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	28.78	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	47.34	MARGINAL	YES				YES
MORTAR (ASTM C144)	14.64	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	113.70	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	0.0	SUITABLE	YES				
AIRFIELD RUNWAYS (P. OF M.)	0.0	SUITABLE	YES				
PIT RUN (P. OF M.)	20.30	MARGINAL	YES		YES		
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE					
SHOULDERS (P. OF M.)							

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003925A01208E33NEEN580A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 2445.80 GMS. WASHED SAMPLE - WEIGHT BEFORE 644.80 AFTER 631.50 % LOSS 2.06

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		0.0	0.0	100.00	0.0
3/4 IN		0.0	0.0	100.00	0.0
5/8 IN	0.0	0.0	0.0	100.00	0.0
1/2 IN	4.50	17.07	0.70	99.30	0.70
3/8 IN	16.70	63.35	2.59	96.71	3.29
1/4 IN	17.00	64.49	2.64	94.08	5.92
#4	10.30	39.07	1.60	92.48	7.52
#8	25.40	96.35	3.94	88.54	11.46
#10	7.90	29.97	1.23	87.31	12.69
#16	13.20	50.07	2.05	85.27	14.73
#30	70.70	268.17	10.96	74.30	25.70
#40	142.80	541.65	22.15	52.00	48.00
#50	134.80	511.48	20.91	31.09	68.91
#60	141.40	536.38	21.93	9.16	90.84
#100	21.60	81.95	3.35	5.80	94.20
#200	20.20	76.62	3.13	2.66	97.34
<200 + W	13.30	50.45	2.06	0.0	100.00
TOTALS	644.80	2445.80			

SPLITTING FACTOR 3.79

FINENESS MODULUS 2.27

% COBBLES 0.0 % PEBBLES 7.52 % GRANULES 5.16 % SAND 85.25 % SILT/CLAY 2.06

I N D U S T R I A L U S A G E A S S E S S M E N T

003925A01208E33NEEN580A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	83.50	NOT SUIT					
ASPHALT B (P. OF M.)	74.50	NOT SUIT					
ASPHALT C (P. OF M.)	74.50	MARGINAL	YES	YES			
BASE COURSE A (P. OF M.)	82.73	NOT SUIT					
BASE COURSE B (P. OF M.)	56.73	NOT SUIT					
BASE COURSE C (P. OF M.)	14.43	MARGINAL		YES		YES	
SUB-BASE/BASE COURSE A (ASTM D1241)	146.50	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	126.44	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	121.44	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	32.73	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	5.94	MARGINAL		YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	5.94	MARGINAL		YES			YES
TRAFFIC GRAVEL A (P. OF M.)	113.03	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	87.03	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	81.09	NOT SUIT					
SEAL COAT A (P. OF M.)	98.78	NOT SUIT					
SEAL COAT B (P. OF M.)	125.90	NOT SUIT					
SEAL COAT C (P. OF M.)	100.49	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	27.37	MARGINAL	YES				
COARSE AGGREGATE 3 (ASTM C33;D448)	271.06	NOT SUIT					YES
COARSE AGGREGATE 34 (ASTM C33;D448)	318.06	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	325.39	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	310.39	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	327.62	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	327.97	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	325.25	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	327.08	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	329.58	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	209.38	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	314.56	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	308.79	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	329.06	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	268.79	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	349.06	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	274.23	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	189.02	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	157.39	NOT SUIT					
FINE CONCRETE AGGREGATE (P. OF M.)	5.76	MARGINAL	YES				
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	9.68	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	21.59	MARGINAL	YES				YES
MORTAR (ASTM C144)	10.35	MARGINAL	YES				YES
PORTLAND CEMENT (P.C.A.)	0.0	SUITABLE	YES				YES
BUILT-UP ROOFS (ASTM D1863)	63.05	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	169.29	NOT SUIT					
PIT RUN (P. OF M.)	66.81	NOT SUIT					
SEPTIC FIELDS (U.M.A.)	17.48	MARGINAL					
SHOULDERS (P. OF M.)	30.00	MARGINAL				YES	
	22.48	MARGINAL				YES	
						YES	

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 6

SAMPLE IDENTIFICATION 003926 012 08E24N8WEN608A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 3036.80 GMS. WASHED SAMPLE - WEIGHT BEFORE 740.20 AFTER 723.50 % LOSS 2.26

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		101.20	2.81	97.19	2.81
1 IN		319.10	6.77	88.43	11.57
3/4 IN		151.90	4.20	84.23	15.77
5/8 IN	17.10	75.14	1.95	82.28	17.72
1/2 IN	18.40	75.09	2.09	80.19	19.81
3/8 IN	19.50	80.00	2.22	77.97	22.03
1/4 IN	34.20	140.31	3.89	74.08	25.92
#4	28.50	116.93	3.24	70.83	29.17
#8	105.40	444.23	12.33	58.50	41.50
#10	41.60	174.77	4.85	53.65	46.35
#14	73.50	301.55	8.36	45.29	54.71
#18	72.90	848.84	2.54	21.75	78.25
#40	64.00	262.67	7.28	14.46	85.54
#50	51.80	212.52	5.89	8.57	91.43
#60	42.20	173.13	4.80	3.77	96.23
#100	5.60	22.97	0.64	3.13	96.87
#200	10.80	44.31	1.23	1.90	98.10
<200 + W	16.70	68.51	1.90	0.0	100.00
TOTALS	740.20	3605.50			

SPLITTING FACTOR 4.10

FINENESS MODULUS 4.33

% COBBLES 0.0 % PEBBLES 29.17 % GRANULES 17.18 % SAND 51.75 % SILT/CLAY 1.90

I N D U S T R I A L U S A G E A S S E S S M E N T

003926 012 08E24N8WEN608A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	25.37	MARGINAL	YES		YES		YES
ASPHALT B (P. OF M.)	17.80	MARGINAL	YES		YES		YES
ASPHALT C (P. OF M.)	51.10	NOT SUIT					
BASE COURSE A (P. OF M.)	28.54	MARGINAL	YES	YES	YES		YES
BASE COURSE B (P. OF M.)	2.46	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	5.66	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	43.65	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	26.09	MARGINAL	YES	YES	YES		YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	31.80	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	14.50	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	7.50	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	19.50	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	53.75	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	33.75	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	17.47	MARGINAL	YES		YES		YES
TRAFFIC GRAVEL D (P. OF M.)	10.11	MARGINAL	YES		YES		
SEAL COAT A (P. OF M.)	99.66	NOT SUIT					
SEAL COAT B (P. OF M.)	21.37	MARGINAL	YES		YES		YES
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33;D448)	205.92	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	193.75	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	144.25	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	197.41	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	115.46	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	176.25	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	128.93	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	180.34	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	191.22	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	142.58	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	185.71	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	168.58	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	181.80	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	157.36	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	186.15	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	174.14	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	129.62	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	90.56	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	7.42	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	0.0	SUITABLE	YES				
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	9.12	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	19.62	MARGINAL	YES				
MORTAR (ASTM C144)	12.41	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	0.0	SUITABLE	YES				
BUILT-UP ROOFS (ASTM D1863)	157.68	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	14.95	MARGINAL	YES		YES		YES
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	16.66	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	0.83	MARGINAL			YES		

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

SAMPLE IDENTIFICATION 003927 01208E245WEN607A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 5539.60 GMS. WASHED SAMPLE - WEIGHT BEFORE 734.90 AFTER 714.60 % LOSS 2.76

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		60.60	1.01	98.99	1.01
3/4 IN		442.40	7.36	91.63	8.37
5/8 IN	38.20	287.95	4.79	86.84	13.16
1/2 IN	44.50	335.44	5.58	81.26	18.74
3/8 IN	85.60	645.24	10.73	70.53	29.47
1/4 IN	77.10	581.17	9.67	60.86	39.14
# 4	55.40	417.60	6.95	53.92	46.08
# 8	78.00	593.99	9.88	44.03	55.97
# 10	31.10	235.94	3.92	40.11	59.89
# 16	34.10	257.04	4.28	35.83	64.17
# 30	119.10	897.76	14.93	20.90	79.10
# 40	40.60	306.04	5.09	15.81	84.19
# 50	31.50	237.44	3.95	11.86	88.14
# 60	47.80	360.31	5.99	5.87	94.13
# 100	9.50	74.63	1.24	4.63	95.37
# 200	16.70	125.86	2.09	2.53	97.47
<200 + W	20.19	152.16	2.53	0.0	100.00
TOTALS	730.78	6011.57			

SPLITTING FACTOR 7.54

FINENESS MODULUS 4.67

% COBBLES 0.0 % PEBBLES 46.08 % GRANULES 13.81 % SAND 37.58 % SILT/CLAY 2.53

INDUSTRIAL USAGE ASSESSMENT

003927 01208E245WEN607A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	0.23	MARGINAL	YES				
ASPHALT B (P. OF M.)	0.0	SUITABLE	YES				
ASPHALT C (P. OF M.)	48.58	NOT SUIT					
BASE COURSE A (P. OF M.)	5.24	MARGINAL	YES	YES			
BASE COURSE B (P. OF M.)	1.47	MARGINAL		YES			
BASE COURSE C (P. OF M.)	1.47	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	5.64	MARGINAL			YES		YES
SUB-BASE/BASE COURSE B (ASTM D1241)	9.46	MARGINAL		YES	YES		
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	2.44	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	14.47	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	6.01	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	49.49	NOT SUIT					
TRAFFIC GRAVEL A (P. OF M.)	5.24	MARGINAL	YES	YES			
TRAFFIC GRAVEL B (P. OF M.)	5.24	MARGINAL	YES	YES			
TRAFFIC GRAVEL C (P. OF M.)	5.24	MARGINAL	YES				
TRAFFIC GRAVEL D (P. OF M.)	0.0	SUITABLE	YES				
SEAL COAT A (P. OF M.)	73.90	NOT SUIT					
SEAL COAT B (P. OF M.)	4.45	MARGINAL	YES				YES
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33,D448)	213.16	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33,D448)	203.16	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33,D448)	199.43	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,D448)	191.79	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,D448)	130.70	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	187.69	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,D448)	112.61	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,D448)	174.96	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,D448)	168.67	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,D448)	105.74	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,D448)	132.46	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,D448)	101.75	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,D448)	102.95	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,D448)	96.94	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,D448)	111.05	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,D448)	121.75	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,D448)	64.55	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33,D448)	66.80	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,D448)	14.59	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	13.69	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33, C404)	36.12	NOT SUIT					
FINE CONCRETE AGGREGATE II (ASTM C33, C404)	13.33	MARGINAL	YES				
MORTAR (ASTM C144)	13.33	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	14.12	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	97.44	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	0.0	SUITABLE	YES				
PIT RUN (P. OF M.)	0.0	SUITABLE					
SEPTIC FIELDS (U.M.A.)	21.63	MARGINAL			YES		
SHOULDERS (P. OF M.)	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003928 01208E14SWEN604A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3942.80 GMS. WASHED SAMPLE - WEIGHT BEFORE 944.10 AFTER 918.70 % LOSS 2.69

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		347.60	7.76	92.24	7.76
1 IN		29.80	0.67	91.58	8.42
3/4 IN		160.30	3.58	88.00	12.00
5/8 IN	36.60	122.65	3.41	84.59	15.41
1/2 IN	21.10	88.12	2.97	82.62	17.38
3/8 IN	24.50	266.86	8.96	76.99	23.34
1/4 IN	82.80	345.79	7.73	68.95	31.05
# 4	48.80	203.80	4.55	64.40	35.60
# 8	154.70	646.07	14.42	49.98	50.02
# 10	44.70	186.68	4.17	45.81	54.19
# 16	58.70	245.15	5.47	40.34	59.66
# 30	215.20	898.55	20.06	20.28	79.72
# 40	64.90	354.56	7.91	12.37	87.63
# 50	59.60	237.21	5.29	7.07	92.93
# 80	35.00	146.17	3.26	3.81	96.19
# 100	3.70	15.45	0.34	3.47	96.53
# 200	11.80	49.28	1.10	2.37	97.63
<200 + W	25.40	106.08	2.37	0.0	100.00
TOTALS	944.10	4480.49			

SPLITTING FACTOR 4.18

FINENESS MODULUS 4.58

% COBBLES 0.0 % PEBBLES 35.60 % GRANULES 18.59 % SAND 43.44 % SILT/CLAY 2.37

I N D U S T R I A L U S A G E A S S E S S M E N T

003928 01208E14SWEN604A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <@200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <@4)
ASPHALT A (P. OF M.)	4.13	MARGINAL	YES		YES		
ASPHALT B (P. OF M.)	0.0	SUITABLE	YES				
ASPHALT C (P. OF M.)	53.92	NOT SUIT					
BASE COURSE A (P. OF M.)	9.44	MARGINAL	YES	YES	YES		
BASE COURSE B (P. OF M.)	3.02	MARGINAL	YES	YES			
BASE COURSE C (P. OF M.)	1.63	MARGINAL		YES			
SUB-BASE/BASE COURSE A (ASTM D1241)	26.88	MARGINAL				YES	YES
SUB-BASE/BASE COURSE B (ASTM D1241)	12.14	MARGINAL	YES	YES		YES	YES
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	9.26	MARGINAL	YES	YES	YES		YES
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	16.91	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	9.91	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	24.88	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	29.44	MARGINAL	YES	YES	YES		YES
TRAFFIC GRAVEL B (P. OF M.)	12.38	MARGINAL	YES	YES	YES		
TRAFFIC GRAVEL C (P. OF M.)	0.54	MARGINAL	YES		YES		
TRAFFIC GRAVEL D (P. OF M.)	0.32	MARGINAL	YES		YES		
SEAL COAT A (P. OF M.)	83.84	NOT SUIT					
SEAL COAT B (P. OF M.)	7.94	MARGINAL	YES		YES		
SEAL COAT C (P. OF M.)	0.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33,D448)	201.61	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33,D448)	191.61	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33,D448)	183.23	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33,D448)	177.81	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33,D448)	134.96	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33,D448)	182.61	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33,D448)	128.19	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33,D448)	199.65	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33,D448)	209.46	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33,D448)	140.13	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33,D448)	170.84	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33,D448)	140.20	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33,D448)	149.25	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33,D448)	128.79	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33,D448)	149.63	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33,D448)	144.15	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33,D448)	97.66	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33,D448)	75.13	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33,D448)	8.57	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	6.77	MARGINAL	YES				
FINE CONCRETE AGGREGATE I (ASTM C33, C404)	26.58	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33, C404)	24.91	MARGINAL	YES				
MORTAR (ASTM C144)	17.37	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	6.77	MARGINAL	YES				
BUILT-UP ROOFS (ASTM D1863)	129.79	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	0.32	MARGINAL	YES		YES		
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	25.40	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	0.0	SUITABLE					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 3

SAMPLE IDENTIFICATION 003929 012G8E11NWEN603A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 3257.90 GMS. WASHED SAMPLE - WEIGHT BEFORE 894.90 AFTER 882.80 % LOSS 1.35

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		0.0	0.0	100.00	0.0
3/4 IN		0.0	0.0	100.00	0.0
5/8 IN	20.60	74.99	2.58	97.70	2.30
1/2 IN	4.40	16.02	0.49	97.21	2.79
3/8 IN	9.00	32.78	1.01	96.20	3.80
1/4 IN	20.30	73.90	2.27	93.93	6.07
# 4	29.00	105.58	3.24	90.69	9.31
# 8	99.70	362.96	11.14	79.55	20.45
# 10	39.00	141.98	4.36	75.19	24.81
# 16	76.00	276.68	8.49	66.70	33.30
# 30	251.50	915.59	28.10	38.60	61.40
# 40	117.00	425.84	13.07	25.52	74.48
# 50	97.00	353.13	10.84	14.68	85.32
# 80	103.20	375.70	11.53	3.15	96.85
# 100	8.00	29.12	0.89	2.27	97.73
# 200	8.10	29.49	0.91	1.35	98.65
<200 + W	12.10	44.05	1.34	0.0	100.00
TOTALS	894.90	3257.90			

SPLITTING FACTOR 3.64

FINENESS MODULUS 3.11

% COBBLES 0.0 % PEBBLES 9.31 % GRANULES 15.50 % SAND 73.84 % SILT/CLAY 1.35

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INDUSTRIAL USAGE ASSESSMENT

003929 012G8E11NWEN603A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	47.73	NOT SUIT					
ASPHALT B (P. OF M.)	37.73	NOT SUIT					
ASPHALT C (P. OF M.)	44.97	NOT SUIT					
BASE COURSE A (P. OF M.)	47.58	NOT SUIT					
BASE COURSE B (P. OF M.)	29.53	MARGINAL		YES		YES	YES
BASE COURSE C (P. OF M.)	19.34	MARGINAL		YES		YES	
SUB-BASE/BASE COURSE A (ASTM D1241)	108.26	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	90.73	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	65.73	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	17.53	MARGINAL		YES		YES	YES
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	4.65	MARGINAL		YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	11.13	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	74.72	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	54.74	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	48.09	NOT SUIT					
TRAFFIC GRAVEL D (P. OF M.)	22.90	MARGINAL				YES	
SEAL COAT A (P. OF M.)	112.44	NOT SUIT					
SEAL COAT B (P. OF M.)	34.55	NOT SUIT					
SEAL COAT C (P. OF M.)	1.49	MARGINAL	YES				YES
COARSE AGGREGATE 1 (ASTM C33;D448)	220.35	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	210.35	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	222.56	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	207.56	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	183.25	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	221.55	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	183.24	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	223.74	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	224.79	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	192.80	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	209.45	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	196.80	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	228.50	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	176.80	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	218.50	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	199.46	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	169.45	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	112.70	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	8.06	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	0.0	SUITABLE	YES				
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	0.73	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	7.28	MARGINAL	YES				
MORTAR (ASTM C144)	7.28	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	0.0	SUITABLE	YES				
BUILT-UP ROOFS (ASTM D1863)	177.30	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	50.29	NOT SUIT					
PIT RUN (P. OF M.)	15.69	MARGINAL				YES	
SEPTIC FIELDS (U.M.A.)	30.00	MARGINAL				YES	
SHOULDERS (P. OF M.)	20.69	MARGINAL				YES	

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 5

SAMPLE IDENTIFICATION 003931 01208E18N4WEN554A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 270.70 GMS. WASHED SAMPLE - WEIGHT BEFORE 270.70 AFTER 253.00 % LOSS 6.54

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		0.0	0.0	100.00	0.0
1 1/2 IN		0.0	0.0	100.00	0.0
1 IN		0.0	0.0	100.00	0.0
3/4 IN		0.0	0.0	100.00	0.0
5/8 IN	0.0	0.0	0.0	100.00	0.0
1/2 IN	0.0	0.0	0.0	100.00	0.0
3/8 IN	0.0	0.0	0.0	100.00	0.0
1/4 IN	0.0	0.0	0.0	100.00	0.0
# 4	0.0	0.0	0.0	100.00	0.0
# 6	0.0	0.0	0.0	100.00	0.0
# 10	0.0	0.0	0.0	100.00	0.0
# 16	0.10	0.10	0.04	99.96	0.04
# 30	0.0	0.0	0.0	99.96	0.04
# 40	0.10	0.10	0.04	99.93	0.07
# 50	0.40	0.40	0.15	99.78	0.22
# 80	74.90	71.90	26.55	73.22	26.78
# 100	65.70	65.70	24.27	48.95	51.05
# 200	114.80	114.80	42.41	6.54	93.46
<200 + M	17.70	17.70	6.54	0.0	100.00
TOTALS	270.70	270.70			

SPLITTING FACTOR 1.00

FINENESS MODULUS 0.51

% COBBLES 0.0 % PEBBLES 0.0 % GRANULES 0.0 % SAND 93.46 % SILT/CLAY 6.54

INDUSTRIAL USAGE ASSESSMENT

003931 01208E18N4WEN554A

* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *

INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	154.93	NOT SUIT					
ASPHALT B (P. OF M.)	144.93	NOT SUIT					
ASPHALT C (P. OF M.)	0.0	SUITABLE					
BASE COURSE A (P. OF M.)	146.39	NOT SUIT					
BASE COURSE B (P. OF M.)	124.93	NOT SUIT			YES		
BASE COURSE C (P. OF M.)	20.00	MARGINAL					
SUB-BASE/BASE COURSE A (ASTM D1241)	219.93	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	184.93	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	169.93	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	101.36	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	49.63	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	31.38	NOT SUIT					
TRAFFIC GRAVEL A (P. OF M.)	176.39	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	151.39	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	149.93	NOT SUIT					
TRAFFIC GRAVEL D (P. OF M.)	104.93	NOT SUIT					
SEAL COAT A (P. OF M.)	141.53	NOT SUIT					
SEAL COAT B (P. OF M.)	117.46	NOT SUIT					
SEAL COAT C (P. OF M.)	117.49	NOT SUIT					
COARSE AGGREGATE 1 (ASTM C33.0448)	225.54	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33.0448)	215.54	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33.0448)	230.54	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33.0448)	215.54	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33.0448)	200.54	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33.0448)	210.54	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33.0448)	200.54	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33.0448)	235.54	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33.0448)	225.54	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33.0448)	230.54	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33.0448)	230.54	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33.0448)	235.54	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33.0448)	200.54	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33.0448)	215.54	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33.0448)	240.54	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33.0448)	260.54	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33.0448)	305.28	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33.0448)	250.28	NOT SUIT					YES
COARSE AGGREGATE 10 (ASTM C33.0448)	24.49	MARGINAL					
FINE CONCRETE AGGREGATE (P. OF M.)	72.78	NOT SUIT					
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	195.49	NOT SUIT					
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	220.93	NOT SUIT					YES
MORTAR (ASTM C144)	21.85	MARGINAL					
PORTLAND CEMENT (P.C.A.)	218.19	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	219.04	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	109.87	NOT SUIT			YES		
PIT RUN (P. OF M.)	45.00	MARGINAL			YES		
SEPTIC FIELDS (U.M.A.)	30.00	MARGINAL			YES		
SHOULDERS (P. OF M.)	30.00	MARGINAL					

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 7

SAMPLE IDENTIFICATION 003932 01207E04NEEN610A
AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE
WEIGHT OF SAND 2734.60 GMS. WASHED SAMPLE - WEIGHT BEFORE 787.70 AFTER 780.00 % LOSS 0.98

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		0.0	0.0	100.00	0.0
2 IN		178.80	1.50	98.50	1.50
1 1/2 IN		0.0	0.00	98.50	1.50
1 IN		47.00	0.93	97.57	2.43
3/4 IN		48.30	0.94	96.63	3.37
5/8 IN	21.40	74.20	1.45	95.18	4.82
1/2 IN	12.00	142.20	2.80	92.38	7.62
3/8 IN	45.00	190.00	3.73	88.65	10.98
1/4 IN	60.20	250.20	4.91	83.74	16.09
# 4	44.00	294.20	5.78	77.96	17.87
# 6	148.00	511.60	10.05	67.91	27.92
# 10	43.00	554.60	10.89	57.02	32.81
# 16	42.60	597.20	11.73	45.29	43.54
# 30	137.30	734.50	14.42	30.87	57.96
# 40	660.60	2395.10	44.02	16.85	71.98
# 50	98.00	493.10	9.68	7.17	81.66
# 80	5.00	511.10	0.10	7.07	81.76
# 100	5.00	517.10	0.10	6.97	81.86
# 200	6.30	541.07	0.43	6.92	82.29
<200 + M	13.63	47.31	0.93	0.0	100.00
TOTALS	1394.83	5114.03			

SPLITTING FACTOR 3.47
FINENESS MODULUS 3.33
% COBBLES 0.0 % PEBBLES 17.81 % GRANULES 12.97 % SAND 68.30 % SILT/CLAY 0.93

I N D U S T R I A L U S A G E A S S E S S M E N T 003932 01207E04NEEN610A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING MATERIAL ON SITE	REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	42.53	NOT SUIT					
ASPHALT B (P. OF M.)	35.36	NOT SUIT					
ASPHALT C (P. OF M.)	24.19	NOT SUIT					
BASE COURSE A (P. OF M.)	24.18	NOT SUIT					
BASE COURSE B (P. OF M.)	22.38	MARGINAL	YES	YES	YES		YES
BASE COURSE C (P. OF M.)	8.21	MARGINAL	YES	YES	YES		
SUB-BASE/BASE COURSE A (ASTM D1241)	48.48	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	79.98	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	38.46	MARGINAL	YES	YES	YES		YES
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	27.32	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	24.33	MARGINAL	YES	YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	24.33	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	69.68	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	49.36	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	49.03	NOT SUIT					
TRAFFIC GRAVEL D (P. OF M.)	19.02	MARGINAL	YES		YES		
SEAL COAT A (P. OF M.)	109.98	NOT SUIT					
SEAL COAT B (P. OF M.)	19.02	MARGINAL	YES		YES		
SEAL COAT C (P. OF M.)	9.0	SUITABLE	YES				
COARSE AGGREGATE 1 (ASTM C33;D448)	211.14	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	187.44	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	108.44	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	92.40	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	145.09	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	114.22	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	170.94	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	214.22	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	241.00	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	160.00	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	201.00	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	164.00	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	149.29	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	147.00	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	145.00	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	147.00	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	169.00	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	8.32	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	1.01	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	12.38	MARGINAL	YES				
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	4.21	MARGINAL	YES				YES
MORTAR (ASTM C144)	24.21	MARGINAL	YES				
PORTLAND CEMENT (P.C.A.)	167.91	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	50.03	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	18.11	MARGINAL	YES		YES		
PIT RUN (P. OF M.)	22.09	MARGINAL	YES		YES		
SEPTIC FIELDS (U.M.A.)	15.17	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)							

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 5

SAMPLE IDENTIFICATION 003932 01207E09SWEN596A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - NONE

WEIGHT OF SAND 1993.80 GMS. WASHED SAMPLE - WEIGHT BEFORE 1006.20 AFTER 881.00 % LOSS 12.44

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		600.70	22.47	77.53	22.47
2 IN		0.0	0.0	77.53	22.47
1 1/2 IN		0.0	0.0	77.53	22.47
1 IN		37.10	1.39	76.15	23.85
3/4 IN		42.10	1.57	74.57	25.43
5/8 IN	56.30	111.56	4.17	70.40	29.60
1/2 IN	16.60	32.89	1.23	69.17	30.83
3/8 IN	32.40	64.20	2.40	66.77	33.23
1/4 IN	63.10	125.03	4.68	62.09	37.91
#4	31.70	62.81	2.35	59.74	40.26
# 8	89.70	177.74	6.65	53.09	46.91
# 10	37.00	73.32	2.74	50.35	49.65
# 16	44.10	87.38	3.27	47.08	52.92
# 30	148.60	294.45	11.01	36.07	63.93
# 40	54.80	108.56	4.06	32.01	67.99
# 50	50.20	99.47	3.72	28.29	71.71
# 80	109.20	216.30	8.09	20.20	79.80
# 100	36.10	71.53	2.68	17.52	82.48
# 200	111.20	220.34	8.24	9.28	90.72
<200 + W	125.20	248.09	9.28	0.0	100.00
TOTALS	1006.20	2673.70			

SPLITTING FACTOR 1.98

FINENESS MODULUS 4.39

% COBBLES 22.47 % PEBBLES 17.79 % GRANULES 9.39 % SAND 41.07 % SILT/CLAY 9.28

INDUSTRIAL USAGE ASSESSMENT

003932 01207E09SWEN596A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	40.60	NOT SUIT					
ASPHALT B (P. OF M.)	35.00	NOT SUIT					
ASPHALT C (P. OF M.)	7.52	MARGINAL	YES				YES
BASE COURSE A (P. OF M.)	35.52	NOT SUIT					
BASE COURSE B (P. OF M.)	8.34	MARGINAL	YES		YES		YES
BASE COURSE C (P. OF M.)	0.0	SUITABLE	YES				
SUB-BASE/BASE COURSE A (ASTM D1241)	44.20	NOT SUIT					
SUB-BASE/BASE COURSE B (ASTM D1241)	22.60	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	0.0	SUITABLE	YES				
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	0.0	SUITABLE	YES				
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	0.0	SUITABLE	YES				
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	0.0	SUITABLE	YES				
TRAFFIC GRAVEL A (P. OF M.)	50.31	NOT SUIT					
TRAFFIC GRAVEL B (P. OF M.)	33.31	NOT SUIT					
TRAFFIC GRAVEL C (P. OF M.)	27.45	MARGINAL	YES		YES		YES
TRAFFIC GRAVEL D (P. OF M.)	20.49	MARGINAL	YES		YES		YES
SEAL COAT A (P. OF M.)	115.79	NOT SUIT					
SEAL COAT B (P. OF M.)	57.06	NOT SUIT					
SEAL COAT C (P. OF M.)	30.69	NOT SUIT					
COARSE AGGREGATE 1 (ASTM C33;D448)	157.32	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	169.38	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	167.02	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	206.39	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	170.44	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	216.47	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	218.31	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	202.49	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	226.52	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	170.71	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D4.3)	193.16	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	177.05	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	203.68	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	202.29	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	208.43	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	198.62	NOT SUIT					
COARSE AGGREGATE 89 (ASTM C33;D448)	164.51	NOT SUIT					
COARSE AGGREGATE 9 (ASTM C33;D448)	150.30	NOT SUIT					
COARSE AGGREGATE 10 (ASTM C33;D448)	11.00	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	23.29	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	43.51	NOT SUIT					
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	61.54	NOT SUIT					
MORTAR (ASTM C144)	15.99	MARGINAL	YES				YES
PORTLAND CEMENT (P.C.A.)	60.57	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	162.79	NOT SUIT					
AIRFIELD RUNWAYS (P. OF M.)	33.63	NOT SUIT					
PIT RUN (P. OF M.)	2.05	MARGINAL	YES		YES		
SEPTIC FIELDS (U.M.A.)	26.18	MARGINAL	YES		YES		
SHOULDERS (P. OF M.)	7.05	MARGINAL	YES		YES		

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 5

SAMPLE IDENTIFICATION 003934 01207E07SWENS98A

AVAILABILITY OF CRUSHABLE MATERIAL ON SITE - YES

WEIGHT OF SAND 2517.20 GMS. WASHED SAMPLE - WEIGHT BEFORE 706.10 AFTER 659.00 % LOSS 6.67

SIEVE SIZE	FINE FRACTION (GMS.)	SIEVE WEIGHTS (GMS.)	PERCENT	PERCENT PASSING	PERCENT RETAINED
4 IN		0.0	0.0	100.00	0.0
3 1/2 IN		0.0	0.0	100.00	0.0
3 IN		0.0	0.0	100.00	0.0
2 1/2 IN		662.70	14.58	85.42	14.58
2 IN		0.0	0.0	85.42	14.58
1 1/2 IN		236.30	5.20	80.23	19.77
1 IN		662.10	14.64	65.58	34.42
3/4 IN		466.40	10.26	55.32	44.68
1/2 IN		424.58	9.34	45.98	54.02
3/8 IN	119.10	189.94	4.16	41.79	58.21
1/2 IN	51.80	277.35	6.10	35.42	64.58
1/8 IN	47.80	209.47	4.61	30.81	69.19
1/4 IN	97.10	132.26	2.91	27.90	72.10
# 4	80.90	266.40	5.86	22.04	77.96
# 8	80.90	91.62	2.02	20.02	79.98
# 10	25.70	69.77	1.53	18.49	81.51
# 16	24.90	335.10	7.37	11.12	88.88
# 30	54.00	93.46	2.06	9.06	90.94
# 40	17.80	39.57	0.87	8.19	91.81
# 50	11.60	59.53	1.31	6.88	93.12
# 80	16.70	155.53	3.42	3.46	96.54
# 100	4.30	15.80	0.35	3.12	96.88
# 200	15.40	142.00	3.12	0.0	100.00
<200 + M	47.10	167.91	3.70		
TOTALS	786.10	4543.98			

SPLITTING FACTOR 3.56

FINENESS MODULUS 6.45

% COBBLES 14.58 % PEBBLES 58.91 % GRANULES 8.36 % SAND 14.45 % SILT/CLAY 3.70

INDUSTRIAL USAGE ASSESSMENT

003934 01207E07SWENS98A

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* NOTE - SUITABILITY OF SAMPLE IS BASED ONLY ON GRADING SPECIFICATIONS *
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INDUSTRIAL USE	TOTAL RESIDUAL	RATING	SCREENING REQUIRED	REMOVAL OF <#200 MATERIAL	CRUSHING REQUIRED MATERIAL ON SITE	CRUSHING REQUIRED MATERIAL NOT ON SITE	ADDITION OF FINES (MATERIAL <#4)
ASPHALT A (P. OF M.)	23.25	MARGINAL	YES				
ASPHALT B (P. OF M.)	6.78	MARGINAL	YES				
ASPHALT C (P. OF M.)	47.14	NOT SUIT		YES			
BASE COURSE A (P. OF M.)	2.93	MARGINAL	YES				
BASE COURSE B (P. OF M.)	10.08	MARGINAL	YES				
BASE COURSE C (P. OF M.)	0.0	SUITABLE	YES				
SUB-BASE/BASE COURSE A (ASTM D1241)	0.0	SUITABLE	YES	YES			
SUB-BASE/BASE COURSE B (ASTM D1241)	6.99	MARGINAL	YES				
SUB-BASE/BASE/SURFACE COURSE C (ASTM D1241)	43.58	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE D (ASTM D1241)	35.05	NOT SUIT					
SUB-BASE/BASE/SURFACE COURSE E (ASTM D1241)	77.05	NOT SUIT		YES			
SUB-BASE/BASE/SURFACE COURSE F (ASTM D1241)	1.33	MARGINAL	YES	YES			
TRAFFIC GRAVEL A (P. OF M.)	1.33	MARGINAL	YES				
TRAFFIC GRAVEL B (P. OF M.)	16.94	MARGINAL	YES				
TRAFFIC GRAVEL C (P. OF M.)	0.0	SUITABLE	YES				YES
TRAFFIC GRAVEL D (P. OF M.)	7.99	NOT SUIT					YES
SEAL COAT A (P. OF M.)	7.33	MARGINAL	YES				
SEAL COAT B (P. OF M.)	4.66	MARGINAL	YES				
SEAL COAT C (P. OF M.)	143.92	NOT SUIT					
COARSE AGGREGATE 1 (ASTM C33;D448)	139.31	NOT SUIT					
COARSE AGGREGATE 2 (ASTM C33;D448)	127.78	NOT SUIT					
COARSE AGGREGATE 24 (ASTM C33;D448)	122.06	NOT SUIT					
COARSE AGGREGATE 3 (ASTM C33;D448)	115.18	NOT SUIT					
COARSE AGGREGATE 357 (ASTM C33;D448)	117.88	NOT SUIT					
COARSE AGGREGATE 4 (ASTM C33;D448)	122.35	NOT SUIT					
COARSE AGGREGATE 467 (ASTM C33;D448)	107.78	NOT SUIT					
COARSE AGGREGATE 5 (ASTM C33;D448)	86.75	NOT SUIT					
COARSE AGGREGATE 56 (ASTM C33;D448)	60.04	NOT SUIT					
COARSE AGGREGATE 57 (ASTM C33;D448)	94.03	NOT SUIT					
COARSE AGGREGATE 6 (ASTM C33;D448)	66.33	NOT SUIT					
COARSE AGGREGATE 67 (ASTM C33;D448)	89.26	NOT SUIT					
COARSE AGGREGATE 68 (ASTM C33;D448)	84.26	NOT SUIT					
COARSE AGGREGATE 7 (ASTM C33;D448)	93.52	NOT SUIT					
COARSE AGGREGATE 78 (ASTM C33;D448)	112.67	NOT SUIT					
COARSE AGGREGATE 8 (ASTM C33;D448)	78.08	NOT SUIT					YES
COARSE AGGREGATE 89 (ASTM C33;D448)	65.14	NOT SUIT					YES
COARSE AGGREGATE 9 (ASTM C33;D448)	20.86	MARGINAL	YES				
COARSE AGGREGATE 10 (ASTM C33;D448)	0.0	MARGINAL	YES				YES
FINE CONCRETE AGGREGATE (P. OF M.)	58.24	NOT SUIT					
FINE CONCRETE AGGREGATE I (ASTM C33; C404)	33.11	NOT SUIT					
FINE CONCRETE AGGREGATE II (ASTM C33; C404)	32.48	MARGINAL	YES				
TOPTAR (ASTM C144)	46.95	NOT SUIT					
PORTLAND CEMENT (P.C.A.)	84.79	NOT SUIT					
BUILT-UP ROOFS (ASTM D1863)	0.0	SUITABLE	YES				
AIRFIELD RUNWAYS (P. OF M.)	0.0	SUITABLE	YES				
PIT RUN (P. OF M.)	0.0	SUITABLE	YES				
SEPTIC FIELDS (U.M.A.)	0.0	SUITABLE	YES				
SHOULDERS (P. OF M.)							

OVERALL SAMPLE RATING (SCALE 1 - 9) IS 4

MANITOBA
DEPARTMENT OF ENERGY AND MINES
MINERAL RESOURCES DIVISION

MAP OF82-5-1

AGGREGATE RESOURCE INVENTORY of the RURAL MUNICIPALITY OF BROKENHEAD

TO ACCOMPANY OPEN FILE REPORT OF82-5

SCALE 1:50 000

KILOMETRES 1 0 1 2 3 4 KILOMETRES

LEGEND

POST GLACIAL

8 ALLUVIUM: present day flood plain and/or valley fill material composed mainly of silt and clay and minor seasonally submerged organic deposits.

7 SWAMP: seasonally submerged organic deposits.

LATE GLACIAL

6 BEACH RIDGES: representing major stillstands of Lake Agassiz, includes spits and offshore bars consisting of sand and gravel.

5 LITTORAL SAND AND GRAVEL:

- 5a wave washed till overlain by a regressive sequence consisting of silt and clay grading upwards into sand and fine pebble gravel. Generally less than 2 metres thick and restricted to flat lying, poorly drained areas.
- 5b massive medium to fine grained sand with minor gravel generally overlying clay. Generally greater than 2 metres thick.

4 LACUSTRINE CLAY: silt and clay deposited in the deep waters of Lake Agassiz.

GLACIAL

3 CALCAREOUS TILL: generally silt-rich and severely jointed calcareous till of northwest provenance commonly modified by wave action. Includes minor areas of sandy till of northeast provenance.

2 GLACIOFLUVIAL SAND AND GRAVEL: glacially overridden glaciofluvial deposits consisting,

- 2a primarily of sand with minor gravel.
- 2b primarily of sand and gravel.

1 BEDROCK

- 1a Precambrian Crystalline Bedrock
- 1b Paleozoic Limestone Bedrock

SYMBOLS

- 3900 Deposit number
- Gravel pit
- Minor beach ridges
- Ice-berg scour
- Esker
- Assumed geological boundary
- Presumed geological boundary

GEOLOGY BY G. CONLEY, 1980

GEOLOGICAL CARTOGRAPHY BY D. BAGWELL, 1982

Rge. 7E.
Rge. 8E.
Rge. 6E.
Twp. 15
Twp. 14
Twp. 13
Twp. 12

POOR

QUALITY

ORIGINAL